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HINTS
REGARDING THE
AGRICULTURAL STATE
OF THE
NETHERLANDS,
COMPARED WITH THAT OF
GREAT BRITAIN;
AND SOME OBSERVATIONS
ON THE MEANS OF
DIMINISHING THE EXPENCE OF GROWING CORN;
OF
PREVENTING THE MILDEW IN WHEAT, THE ROT IN SHEEP,
AND THE INTRODUCTION OF
OTHER IMPROVEMENTS INTO BRITISH AGRICULTURE.

BY
THE RIGHT HONOURABLE
SIR JOHN SINCLAIR, BART.

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THE Author of the following paper left London upon the 23d of February last, (1815), for the Continent, with a view of ascertaining the relative prices of Grain in Great Britain, and in Flanders, France, &c.; the causes of any difference that might exist, and the means by which any material variation might in future be prevented. He went by Dover and Ostend, to Brussels; and thence was induced to take a short excursion to Holland, to examine the state of the Dutch Dairies. It was during his stay there, that intelligence arrived at the Hague, of Bonaparte's having landed in France; and his successful progress afterwards, put an end to all expectation of the Author being enabled to carry on his researches into that country. He was thence led to direct his whole attention to Flemish Agriculture; and he trusts it will appear, from the following observations, that he has not been unsuccessful in his enquiries, though carried on under great disadvantages, the weather having proved unfavourable, and great bodies of troops being dispersed over the frontiers, where the largest farms were to be met with, and those most resembling British occupations. He found the inhabitants, indeed, distracted by apprehensions of an invasion, and much dissatisfied by the inconveniences they felt, and the losses they sustained, from having numbers of soldiers quartered upon them, consequently not likely to pay much attention to

agricultural enquiries. Their kindness and hospitality, however, even in these circumstances, were highly gratifying.

In the course of the following pages, a number of intelligent individuals will be referred to, as having communicated the information therein detailed, to whom the Author considers himself much indebted. He has also to acknowledge the valuable assistance of the Agricultural Societies of Bruges and of Ghent, and the obliging attention of the Intendant of the Department of the Dyle, and of the Duc D'Ursel, Minister of the Interior in the Netherlands, who sent a circular letter to all the Superintendants in the several Departments under his jurisdiction, to procure the information the Author wished for. The answers from these two public ministers, to an entire stranger, are so extremely liberal, that he thought it right to preserve them in the Appendix, (No. V.)

On the whole, instead of giving a journal of the excursion, which was completed in about two months, in the course of which a variety of objects were attended to, it was thought most expedient, to restrict this Work, solely to information of an agricultural nature, and to unite all the information collected at different periods, and from various individuals, under each particular head.

Ham Common, Richmond, Surrey, }
10th May, 1815.

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INTRODUCTORY OBSERVATIONS.

On the relative Prices of Wheat, and other Grain, in Great Britain, and Flanders, since the Year 1771, and the Causes which have occasioned the higher Prices in England.

FLANDERS has long been considered as the most productive, and the best cultivated country on the continent of Europe. In regard to Agricultural Machinery, and Live Stock, Great Britain is certainly superior; but, as will afterwards appear in the course of the following observations, we may still derive several useful lessons in Husbandry from our Flemish neighbours. Indeed, if it were not for their industry and skill in farming, (there being no material difference in regard to soil or climate), the prices would never have been so much lower for so many years; and they could never have been able to furnish us with such quantities of wheat, at lower prices than we can raise it. I was extremely anxious therefore to ascertain, 1. What were the relative prices of wheat in both countries, since the year 1771 inclusive, when the average prices of this kingdom were begun to be regularly kept; and whether any difference of price exists, not only in regard to wheat, but whether it likewise extends to other grain, as barley and oats; and, 2. To what causes the higher prices of grain in England, compared to those in Flanders, ought to be attributed.

1.

Average Prices of Wheat, Barley, and Oats, in Flanders and England, since the Year 1771 inclusive, or a period of 44 Years, in English Quarters, without any reference to the Variations in the course of the exchange.

WHEAT.

				Flanders.				England.				Difference in Money.		
				£	s.	d.		£	s.	d.		£	s.	d.
1.	From 1771 to 1774 inclusive			1	12	1	...	2	10	4	...	0	18	3
2.	1775 — 1779	—		1	7	5	...	2	1	6	...	0	14	1
3.	1780 — 1784	—		1	10	7	...	2	5	11	...	0	15	4
4.	1785 — 1789	—		1	12	6	...	2	7	5	...	0	14	11
5.	1790 — 1794	—		1	16	7	...	2	8	8	...	0	12	1
6.	1795 — 1799	—		2	2	0	...	3	4	5	...	1	2	5
7.	1800 — 1804	—		2	9	2	...	4	3	2	...	1	14	0
8.	1805 — 1809	—		2	10	7	...	4	2	11	...	1	12	4
9.	1810 — 1814	—		2	18	0	...	5	1	5	...	2	3	5
Average of the whole ...				1	19	10	...	3	2	10	...	1	3	0

BARLEY.

1.	From 1771 to 1774			1	0	7	...	1	8	9
2.	1775 — 1779	—		0	14	11	...	1	1	9
3.	1780 — 1784	—		1	0	1	...	1	2	11
4.	1785 — 1789	—		1	2	0	...	1	2	10
5.	1790 — 1794	—		1	2	6	...	1	8	0
6.	1795 — 1799	—		1	4	10	...	1	11	8
7.	1800 — 1804	—		1	6	10	..	2	2	5
8.	1805 — 1809	—		1	3	10	...	2	1	7
9.	1810 — 1814	—		1	8	3	...	2	10	5
Average of the whole ...				1	2	8		1	12	3

OATS.

1.	From 1771 to 1774	—		0	11	6	...	0	16	11
2.	1775 — 1779	—		0	10	5	...	0	15	3
3.	1780 — 1784	—		0	12	5	...	0	16	0
4.	1785 — 1789	—		0	13	4	...	0	16	4
5.	1790 — 1794	—		0	16	1	...	0	19	0
6.	1795 — 1799	—		0	14	5	...	1	1	9
7.	1800 — 1804	—		0	17	4	...	1	8	1
8.	1805 — 1809	—		0	15	9	...	1	10	10
9.	1810 — 1814	—		0	16	4	...	1	13	5
Average of the whole ...				0	14	2		1	1	11

For the satisfaction of those who may be inclined to enter more minutely into these calculations, there is given in the Appendix, (No I.), the average prices of all these grains, for each year respectively, since the year 1771, together with the average prices of rye in Flanders for the same period, being a crop much cultivated in that country, and on which indeed a large proportion of the inhabitants are fed.

Thus it appears, that the average prices, not only of wheat, but of barley and oats, have been progressively increasing since the year 1771, in both countries, but that such increase has proportionally taken place in a greater ratio in England, than in Flanders.

2.

Causes of the higher Prices of Wheat, and other Grains, in England, compared to those in Flanders.

These causes may be classed under the following heads :
 1. Greater expence of cultivation in England ;—2. Higher rents, taxes, and other burdens ;—3. Greater consumption of wheat, and a smaller proportionate consumption of other grains ;—4. Paper circulation ;—and, 5. Difference of system. Each of these heads shall be briefly touched upon.

1. Greater Expence of Cultivation in England.

The expences of cultivation are, in various respects, higher in England than in Flanders, notwithstanding the great superiority of our agricultural machinery ; but I was surprised to find, what large sums were expended in their farm buildings, and the amount of the capital considered to be necessary, when an extensive farm is taken.

Farm-Buildings.

Mr. Mondez of Frasnés, near Charleroi, one of the most intelligent farmers in Flanders, gave me a paper, containing an estimate which he drew up, of the buildings necessary for a farm of 120 French hectares, about 300 English acres; of which the following is an abstract.

	Francs.		Sterling Money.		
			£	s.	d.
Barns	12,811	..	533	15	10
House	16,386	..	682	15	0
Right wing	11,986	..	499	8	4
Left wing	11,986	..	499	8	4
Urine cisterns	1,218	..	50	15	0
Gates	240	..	10	0	0
Walls of the court	1,565	..	65	4	2
Walls of the garden	1,950	..	81	5	0
Wells	575	..	23	19	2
Pavement round the court and the } stables	1,720	..	71	13	4
Fractions	3	..	0	2	6
	<hr/> 60,440		<hr/> £ 2,518	<hr/> 6	<hr/> 8

Yet in the Plain of Fleurus, where these buildings were supposed to be erected, there are many circumstances favourable to cheap construction; and the house of the farmer, instead of being separate, which would have added to the expence, forms a part of the square, and enters from the courtyard. I thought it right to insert, in Appendix, No. II. a Plan of these Buildings, with some farther particulars regarding them, that the reader might have it in his power, in that respect, to compare the systems of the two countries.

Horizontal and Vertical
PLANS OF BUILDINGS FOR A FARM,
of 120 French Hectares or 300 English Acres, according to the Flemish System.

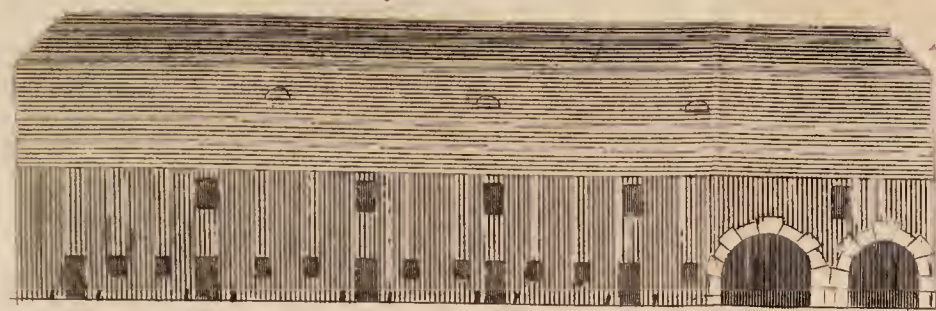


Fig. 3. *Elevation for the Line C.D.*



Fig. 5. *Elevation for the Line G.H.*

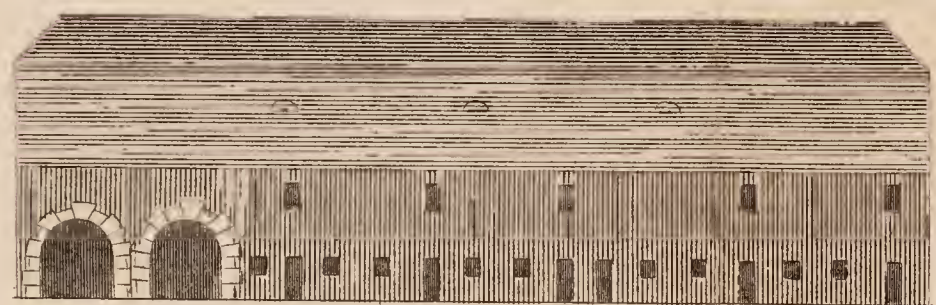
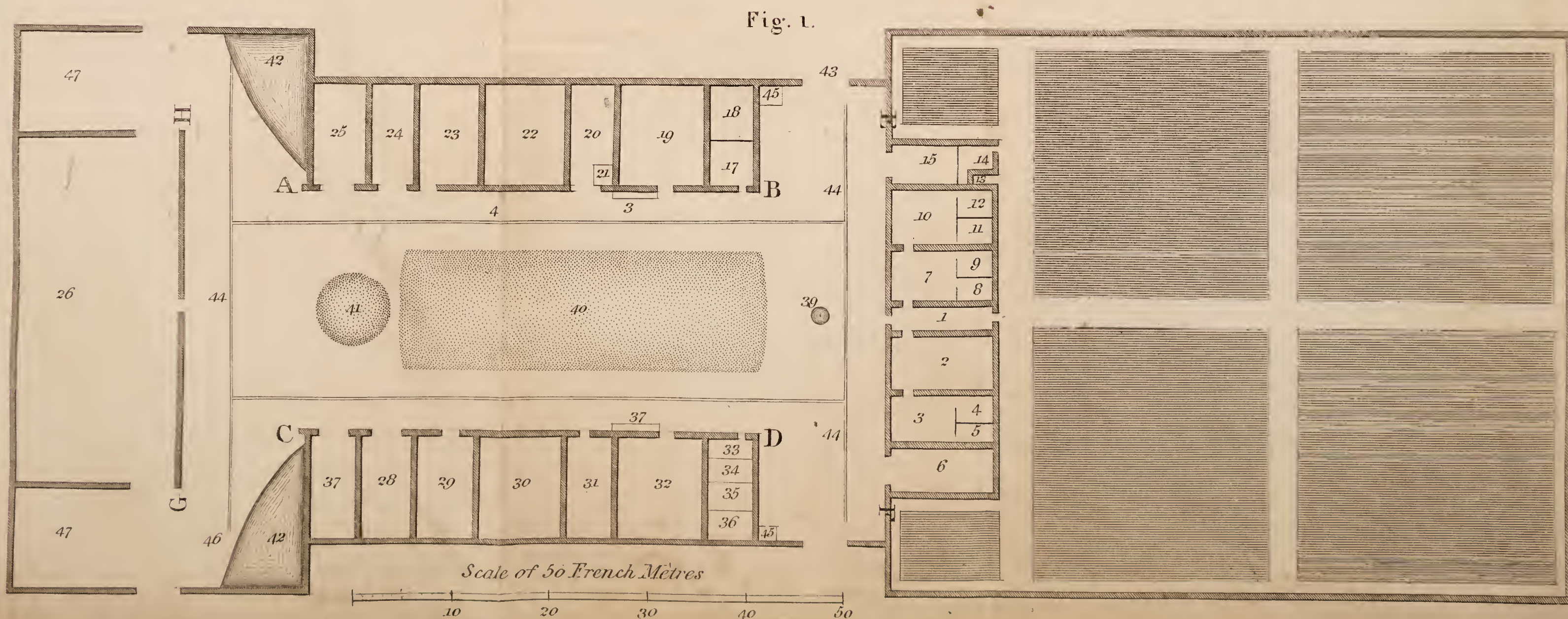


Fig. 2. *Elevation for the Line A.B.*



Fig. 4. *Elevation for the Line E.F.*



Capital required by a Farmer.

Mr. Mondez has likewise drawn up, an account of the capital necessary for the occupation of a farm of 100 French hectares, or about 250 English acres, the expences being continued for 15 months, as till then, no return is made from the farm, unless from the rape or colsat, where that crop is cultivated.

*Articles required for a Farm of about 250 English Acres,
and the Expence of each.*

	Expence in French Money, per France.		Expence in Eng- lish Money.	
			£	s. d.
1. Horses and cattle	17,204	..	716	16 8
2. Waggon, Ploughs, and other instruments of husbandry }	3,312	..	138	0 0
3. Harness	708	..	29	10 0
4. Furniture	5,000	..	208	6 8
5. Servants' wages	2,360	..	90	6 0
6. Maintenance of horses, &c.	3,580	..	140	3 4
7. Various seeds	3,484	..	145	3 4
8. Expence of labourers	1,828	..	76	3 4
	<u>37,476</u>		<u>£ 1544</u>	<u>9 4</u>

A translation of the curious statement above alluded to, shall be given at length in the Appendix, No. III. On the whole, it appears, that the capital required for a Flemish farm, under a proper system, is at the rate of about 6l. 5s. per English acre. The sum is often lower, but then, as Mr. Mondez observes, the farmer in general fails, unless he is assisted by an industrious family, or is fortunate in his harvests.

In so extensive a country as Flanders, the price of articles

necessary for a farm, and the expence of labour, must vary. In the above estimate, the price of a horse is calculated at 400 francs, or 16*l.* 13*s.* 4*d.* sterling, whereas in other parts of the country, I was informed, that a good horse cannot be had, under from 20*l.* to 30*l.* average 25*l.* The expence of maintaining a farm-horse, is stated at about 8*d.* sterling per day, or 11*l.* 6*s.* 8*d.* per annum. The wages of farm servants, are only at the rate of 4*l.* 12*s.* 6*d.* per annum, and their maintenance is estimated at 35 cents per day, or about 16*l.* sterling per annum. A male labourer has only 8*d.* sterling per day, without food; and a female half that sum. All these particulars shall be more fully detailed in the Appendix, No. III.

The expence of cultivation in some parts of Flanders is at the same time considerable, owing to their using hand-labour, for purposes where horses and machinery are employed in England. For instance, in the Pays de Waes, and in other districts in that neighbourhood, the ground is trenched over every seventh year, to the depth of from 15 to 18 inches, and the exhausted surface buried, to bring up fresh soil, enriched by the manure washed down to it in the course of the six preceding years; weeding also, is more carefully attended to in Flanders, than in England, and principally performed by manual labour.

In order to give the reader some idea of the sum required to cultivate a small farm, a middle-sized one, and one of a larger description, some particulars regarding each, shall be stated, though respecting the last, the information is at present extremely deficient.

Expence of cultivating a Bonnier of Land, (about Three English Acres), near Lisle, for Nine Years.

	Francs.		Sterling.		
			£	s.	d.
Ploughing	1056	..	44	0	0
Hand-labour	435	..	18	2	6
Weeding	485	..	20	4	2
Seed	700	..	29	3	4
Manure	2861	..	119	4	2
Rent, at 200 francs per annum	1800	..	75	0	0
Land-tax, 38 francs and 90 cents. } per annum	350	..	14	11	8
Total			£ 320	5	10
Value of the produce during these } nine years	8526	..	£ 355	5	0
Expence	7687	..	320	5	10
Profit			£ 34	19	2

Which divided by nine, give only 93 francs 21 cents, or about 26s. sterling per English acre, per annum.

As this produce is reckoned considerable, and, on an average, it is said ought to be diminished one-sixth, it is evident that small farmers receive a very inadequate recompense for their skill and industry, and the capital they employ in cultivation.

Expence of Cultivating a Farm of Thirty French Hectares, or about Seventy-five English Acres, during the space of Four Years ; by Pierre-Jean de Smet.*

	<i>Value in French Money.</i>	<i>In English Money.</i>
1. Grain purchased for feeding cattle,	6525 ..	271 17 6
2. Oil-cake for cattle,	3700 ..	154 3 4
3. Rape cakes (20,000),	3400 ..	141 13 4
4. Cakes from poppy seed, (16,000), ..	2240 ..	93 6 8
5. Bran for cattle,	2400 ..	100 0 0
6. Ashes from a bleach-field,	890 ..	37 1 8
7. Ditto from a soap work,	130 ..	5 8 4
8. Lime from Tournay,	112 ..	4 13 4
9. Coal,	320 ..	13 6 8
10. 135 lean cows bought for fatten- ing during the four years, at } 5 <i>l.</i> 10 <i>s.</i> each,	17,820 ..	742 10 0
11. Two lads,	360 ..	15 0 0
12. Five male servants,	810 ..	33 15 0
13. Two female servants,	220 ..	9 3 4
14. The smith,	600 ..	25 0 0
15. The wheelwright,	225 ..	9 7 6
16. The harness-maker,	150 ..	6 5 0
17. Five hogs,	400 ..	16 13 4
18. Day labourers,	600 ..	25 0 0
19. Public taxes,	680 ..	28 6 8
20. Rent of the farm,	1450 ..	60 8 4
21. Repairs,	250 ..	10 8 4
22. Loss on the horses kept,	200 ..	8 6 8
23. Interest on the capital, at five per cent.	2019 ..	84 18 0
Total,	45,501	1895 17 6

* From the Process-Verbal of the Agricultural Society of the Department de la Lys, an. 1809.

The gross produce of the arable part of this farm during four years, was at the rate of 1000 francs, or 41*l.* 13*s.* 4*d.* per hectare, which is equal to 10*l.* 8*s.* 4*d.* per annum per English acre. This is a large sum, considering the low price at which the produce of the soil is sold in the Netherlands.

The articles sold from the farm are stated as follow :

	<i>Value in French Money.</i>	<i>In English Money.</i>
1. Wheat,	3000 ..	125 0 0
2. Flax and flax seed,	2000 ..	83 6 8
3. Rape seed,	1200 ..	50 0 0
4. Tobacco,	1500 ..	62 10 0
5. Nursery trees,	200 ..	8 6 8
6, 135 fattened cattle,	37,260 ..	1552 10 0
7. Butter,	1500 ..	62 10 0
8. Butter-milk,	600 ..	25 0 0
	<hr/>	<hr/>
Total sales,	47,260	1969 3 4
Total expence,	45,501	1895 17 6
	<hr/>	<hr/>
Net profits in four years, ..	1759	73 5 10
	<hr/>	<hr/>

This is a very moderate profit indeed, being at the rate of only 22*l.* 7*s.* 8½*d.* per annum, or 5*s.* 11*d.* per acre, out of which, with the interest of the capital, 84*l.* 18*s.* 4*d.* in four years, or 22*l.* 4*s.* 7*d.* per annum, the expences of clothing the family, the purchase of every article not produced on the farm, the education of the children, and unforeseen accidents, must be defrayed.

The profit on fattening 135 head of cattle, is stated at 810*l.* or 6*l.* per head. But the great object for keeping them is, the dung they furnish; in addition to which, 36,000 rape and poppy cakes, besides lime and ashes, were purchased, to carry on the cultivation of the farm.

It appears that the flax and rape crops produce more to the farmer than his crops of wheat, and more than double the rent of the farm; an argument strongly in favour of attention to these crops. In fact, it is the profit thence arising, which enables the farmer to sell his grain so cheap.

Expence of Cultivating a large Farm, according to the Flemish System.

I found it impossible, in a district full of troops quartered on the farmers, (the case of the Walloon country when I visited it), to obtain any satisfactory statement of the expence of cultivating a large farm; but I am promised an exact detail, as soon as peace is restored. Mr. Hanolet, who keeps on his farm 25 working horses, calculates, that the maintenance of each horse costs him only 180 francs, or 7*l.* 10*s.* per annum, though he keeps them constantly in the stable. They are fed differently, according to the season of the year, and the work they have to perform: in the summer, on cut clover; in winter and spring, on oats, beans, hay, and wheat straw. Two are yoked to each plough. He breeds his own horses, as it is difficult always to purchase the sort wanted, and if the expence is more, the farmer is indemnified by the dung of his young stock, and the certainty of having a good breed.

2. Higher Rents, Taxes, and other Public Burdens.

In these respects also, the Flemish has an advantage over the British farmer.

The rent varies according to the quality of the soil, from forty to fifty francs, and thence to 100, and even 200 par hectare, but sixty francs for good arable land is a medium, which is about 20*s.* per acre. In the neighbourhood of

Lisle, however, land is let for 200 francs par bonnier, or about 2*l.* 13*s.* 4*d.* per English acre.

The land-tax is sometimes paid by the tenant, and sometimes by the proprietor. It varies from 10 to about 40 francs, or from 8*s.* 4*d.* to 1*l.* 13*s.* 4*d.* par bonnier, that is, from 2*s.* 9*d.* to 11*s.* 1*d.* per acre. There are no poor rates, church rates, or road assessments; and the farmers, since the revolution, pay no tithes. They complain, however, that their rents and taxes have increased proportionably.

3. *Greater Consumption of Wheat in England.*

Among the circumstances which necessarily tend to lower the price of wheat in Flanders, one cause certainly is, that wheat is not so generally the food of the people, as it is in England, and consequently is much less in demand*. According to the best information I was able to obtain, only one-third of the population of the Netherlands consume wheaten bread, whilst the other two-thirds live on rye. Hence rye is more extensively cultivated than wheat. In the Department of the Scheld, the following is the manner in which the land in cultivation was employed, in the year 1800, when a minute investigation took place, by orders of the French Government.

* Indeed so much less is the consumption of wheat as *bread* in Flanders, and consequently so much cheaper can it be bought for other purposes, that it is sometimes employed in making beer. The best proportion is, 80 parts of wheat, to 52 of barley. Beer thus made is stronger, and keeps much better than when made of barley alone, but it is not fit to drink for 12 months. The longer it is afterwards kept the better. After the strong beer is made, with the addition of fresh hops, excellent small beer may be got.

*State of the manner in which the Land was occupied in the
Department of the Scheld, an. 1800.*

<i>The Crop.</i>	<i>French Hectares.</i>	<i>English Acres.</i>
Wheat	32,161 ..	80,402
Barley	16,173 ..	40,432
Rye	49,229 ..	123,072
Oats	21,118 ..	52,795
Beans, hops, &c.	30,858 ..	77,145
Potatoes	20,216 ..	50,540
Flax	11,759 ..	29,397
Hemp	2,577 ..	6,442
Colsat, or rape	9,583 ..	23,957
Tobacco	1,138 ..	2,845
Natural meadows ..	37,327 ..	93,317
Woods, of all sorts	42,656 ..	106,640
Gardens	8,570 ..	19,425
Kitchen gardens	13,180 ..	32,950
	<hr/> 296,545 <hr/>	<hr/> 739,359 <hr/>

The rye therefore exceeded the proportion both of wheat and barley collectively, and it is only in consequence of so much rye being consumed as bread, that any wheat could be exported from that Department, as is the case in considerable quantities.

There is every reason to believe, that no material alteration in the course of cropping has since taken place; and that in the Netherlands in general, the extent of land cultivated for rye, is about one-third more than what is sown with wheat.

The quantity of potatoes planted, is increasing every year, and they are a favourite food with the people. In regard to oats and barley, they are hardly ever used as bread. In the

worst seasons, oats are rarely deficient. Even in the dear year of 1782, when, owing to the scarcity of that grain, there was a famine in Scotland, oats might have been had for 15s. per English quarter; and there is not an instance, in modern times, of their exportation being prohibited. I think it right to mention these circumstances, in case years of scarcity should again occur, when a great importation of oats would be desirable.

4. *Paper Circulation.*

In Flanders the use of paper money is unknown; whilst its extensive circulation in Great Britain, has hitherto tended to increase the price of our agricultural productions. In manufactures we can carry on a competition with foreign countries, by improvements in machinery, furnished by the artificial capital created by paper; but it is more difficult to apply capital as advantageously in agriculture, as in manufactures. In agriculture there are so many prejudices to contend with, improvements are so long in gaining ground, and so difficult to establish, that our cultivation has not of late increased in proportion to our population. I have no doubt, however, that the command of capital, arising from our paper circulation, might, under a judicious system, lower the price of grain. If, by paper circulation, the interest of money could be reduced to three, or even four per cent., and if a larger proportion of the capital of the country were employed in agriculture, from the improvements that would be thereby effected in draining, manuring, enclosing, &c. the price of grain would be reduced. Indeed the expences of war are ruinous to the farmer, not only by the burdens which they occasion, but by their absorbing so much floating capital, and thereby disabling him from procuring at a reasonable rate the money necessary for carrying on his improvements with spirit; or if it

can be obtained, it is at such a rate of interest, that high prices are necessary to indemnify him. It is a deficiency of capital employed in agriculture, and a high rate of interest, which occasions so many useless wastes, and so much unproductive fallow; which, if cultivated, or cropped, would produce more grain than is necessary for our consumption. At present, abundance of circulation raises the price of grain; but that price would be lowered, if the interest of money were reduced, and more capital employed in agriculture.

In an account drawn up by a most intelligent agriculturist, Mr. Holvoet, dated an. 1808, in which the management of a farm near Menin* is explained, the interest of the capital required by a farmer is stated at four per cent. In other statements, however, the calculation is made at the rate of five per cent.

5. *Difference of System.*

None of the causes, however, above enumerated, have had such an influence in occasioning the high price of grain in England, compared to that of Flanders, as that difference of system which prevails in the two countries. We cultivate enough of land to produce the grain we require, in good seasons; but most unfortunately our crops are frequently ruined by the mildew, or destroyed by insects, and immense tracts of fertile land are kept in fallow, which might be rendered productive; whereas, by adopting some useful practices, which attention to Flemish agriculture has enabled me to ascertain, I have no doubt that grain might be raised in these islands with more certainty, and at a cheaper rate, than at present. For instance, in the Pays

* *Proces-Verbal de la Société d'Agriculture du Department de la Lys, anno 1808, page 83.*

deWaes, they effectually prevent the mildew, and other disorders, by a constant change of seed, and also by preparing their seed-wheat in a peculiar manner, to be afterwards described. By the use of Dutch ashes, they secure an abundant crop of clover, and of wheat afterwards, which is so frequently destroyed by the wire-worm in England. Fallows are in a great measure abolished, even on strong land; by means of which, produce is increased, and the expence of cultivation, on the crops raised in the course of a rotation, necessarily diminished; and by the great profit they derive from their flax and rape or colsat, they can afford to sell their crops of grain at a lower rate. These, and various other improvements, founded on the agricultural practices of Flanders, I have much pleasure in now submitting to the consideration of the farmers of the United Kingdoms, with a full conviction, that by attention to these suggestions, they will be enabled to reduce the expence of cultivation; to increase the produce of the land they cultivate; and will thus have it in their power to sell the articles they raise, at a fair price to the consumer.

At the same time, it is proper to observe, that any attempt to reduce the price of grain, so as to discourage cultivation, is attended with the most injurious consequences. In the year 1811, a number of intelligent farmers in the neighbourhood of Frasnes and Fleurus, in the Walloon country, drew up a paper, in which they make the following comparison between the effects of low and of adequate prices :—" In the year 1774, all the farmers were poor; the low price of grain, of cattle, and of other agricultural productions, retained the most industrious in a state of mediocrity, and fettered all the exertions necessary to obtain good crops. At that period, landlords sought for farmers, and found as much difficulty in getting them, as farmers now find in getting land to hire. The rent of the best land in the Plain of Fleurus, was then

only 12 francs, or 10s. sterling, par bonnier, or about 3s. 4d. per English acre: Afterwards, however, the price of grain and cattle having increased each year, that increase roused the spirit of the farmers, gave them, by degrees, the funds necessary to purchase manures, to increase the quantity of dung in their farm-yards, and to adopt other means of fertilizing their land. The farmers then were animated by success, they made experiments of every sort; and, in a few years, the produce of the soil was doubled."

This is a just comparison, sanctioned by experience, of the effects to be expected from encouraged, or discouraged agriculture.

I.

*On the Means adopted in Flanders for preventing
the Mildew in Wheat.*

UPON examining the prices of wheat in Flanders, I found that for about half a century it had never exceeded sixty shillings per quarter, excepting during four years, when the price was as after specified. In England, on the other hand, the average price of wheat during the last 44 years, had exceeded sixty shillings per quarter, no less a number than seventeen years, and was in the same four years as follows :

		Price per Quarter in Flanders.				Price per Quarter in England.				Difference between the prices in Flanders and in England, per Quarter.		
		£	s.	d.		£	s.	d.		£	s.	d.
1795	....	3	16	2	....	3	14	2	....	0	2	0*
1805	....	3	17	7	....	4	7	1	....	0	7	0
1811	....	3	17	11	....	4	12	5	....	0	14	6
1812	....	3	5	7	....	6	2	8	....	2	16	5

It seemed to me hardly possible, that such circumstances could have taken place, unless, by some means or other, wheat was not liable to the same destructive maladies in Flanders, as it is in England. For ascertaining so interesting a particular, I requested the attention of the Flemish farmers to the following questions :

1. What are the maladies of the different sorts of grain, and how can they be prevented ?

* This is the only year when wheat was cheaper in England than in Flanders, and it is attributed, not to a real scarcity, but to circumstances arising from the French invasion.

2. Do they know in Flanders a malady called in French, “*la nielle*,” and in English “*mildew*,” which renders the straw of wheat blackish, and the grain lean and meagre.

The result of that important enquiry shall be stated as briefly as possible.

1. It appears from the evidence of Mr. Wieland, a most intelligent agriculturist, in Maritime Flanders, that the smut is almost the only malady known in the neighbourhood of Ostend. Land however in the vicinity of the sea, is every where less subject to the mildew, than in more inland districts.

2. Advancing into the interior, the Baron de Serret, Secretary to the Agricultural Society at Bruges, informed me, that he has not any knowledge of a malady that renders the straw of wheat black. The smut is the only disease to which their crops of wheat in the neighbourhood of Bruges are subject, and that prevails, more in their oats and rye, than in their wheat.

3. In the neighbourhood of Ghent, as appears from the evidence of Monsieur Delbecq, Secretary to the Agricultural Society established in that town, the “*nielle*” is but little known; and Mr. Vanhoorebeke of Ghent, who has paid particular attention to this subject, informed me, that though it is found, even in abundance, in certain districts, where the means of obviating it are neglected, yet that by a process to be afterwards described, it is effectually prevented.

4. Mr. Art, a most respectable farmer at Genappe, near Brussels, stated, that he had some mildew one year, but not to any great extent; and that he is persuaded, a change of seed from Holland would have prevented it.

5. Monsieur Plunkett, of Rathmore, at the Chateau de la Basvette, near Wavre, informed me, that the maladies to which the different sorts of grain are subject in his neighbourhood, are not in general of much consequence. At the

same time, it sometimes happen, that the straw of wheat is affected by small black spots, which render the grain of the wheat lean or meagre, and consequently less flour is obtained. The crop may thus be diminished, in fields affected in this manner, to the extent of a fourth part; but the malady is not at all general.

5. In regard to the Pays de Waes (situated between Ghent and Antwerp), which is reckoned the best cultivated district in Flanders, or perhaps on the Continent, Mr. Vandoorslair, who resides at the Chateau de Waesmunster,* positively asserted, that the *nille*, or mildew, is *completely prevented* in that district, owing to a preparation to be afterwards described.

I shall next proceed to assign the causes to which this fortunate exemption may be attributed.

The first cause assigned is, that they sow none but the best and ripest grain. They ascribe the maladies of wheat, and the mildew in particular, to a successive degeneracy in the organs of vegetation in the plants sown, and they maintain, that such maladies can in a great measure be prevented, by taking the ripest grain for seed. For that purpose some farmers select the best ears, while others beat the entire sheafs against a piece of wood, and take only the grains that first drop out. The better the seed the less is used; hence they contend, that the difference in the quantity of flour sown, between a greater quantity of lean, and a smaller quantity of plump grain, is immaterial; and that any advantage likely to arise therefrom, is greatly overbalanced by the risk of having weak or diseased, instead of vigorous and healthy plants.

The next rule they lay down is, to change their seed fre-

* Mr. Gillet of Brussels, introduced me to Mr. Vandoorslair, and other intelligent natives of Flanders, and promoted with great zeal, and by every means in his power, the enquiries in which I was engaged.

quently, in many cases every second year, though, when they are careful to use none but the best seed of their own growth, and to prepare it properly, such a change is in some districts prolonged for eight or ten years. This subject shall afterwards be more fully discussed.

In the third place, they prepare their seed in such a manner, as to prevent the maladies to which wheat is liable, and among the rest, the mildew.

It has been already stated, that the crops of wheat in the celebrated Pays de Waes, are not liable to the smut, the rust, or the mildew*. This was the more surprising, as the fields were small, usually inclosed by trees and hedges, surrounded with ditches, which were in general full of water; and the wheat there cultivated, being of the white sort, was consequently peculiarly liable to the mildew. The climate also is described as being extremely variable, and often very rainy, both in spring and harvest.

I heard at Brussels, that the druggists at Malines, and other towns in that neighbourhood, sold some article to the peasants, to prevent the diseases of wheat; but its name or nature were not known. Upon applying, however, to Mr. Vandoorslair, he informed me, that in the Pays de Waes, they used verdigrise, (the acetate of copper), reduced to powder, in the proportion of about half a pound English of verdigrise to every six bushels of wheat, which was mixed with as much human urine as would enable the light grains to swim at the top, that they might be skimmed off, for which purpose the grain must be often stirred in the vessel. The seed is kept for three hours in this liquid. It is then dried with, or without lime, and sown. There is no danger of injuring the seed by this preparation, but cows' urine

* Foreign writers make a distinction between the rust, or *rouille*, and the mildew or *nielle*.

is more hazardous, from the quantity of ammonia it contains, and if it is used, one hour of steeping is sufficient.

Mr. Vandoorslaer asserts, that this remedy is very ancient, and though it has been found so effectual, it is a most singular circumstance, that it was quite unknown in the neighbouring districts, or to the philosophic world, as appears from the following particulars.

M. Benedict Prevost, a celebrated chymist, was convinced by a variety of experiments, that the smut, the rust, and the mildew, are *real intestine parasitical plants*, or, what the botanists call *uredos* and *puccinias*, the gemmes of which may be grown in water, or moist cloths, and their nature ascertained. He had placed some hundreds of the seeds or *gemmes* of smut in water, which had been distilled in an alembic of copper, when, to his great astonishment, these seeds either did not vegetate, or at least very imperfectly, whilst those which he had put into common water, vegetated as usual. As he was then engaged in a course of experiments, to ascertain the substances the most likely to answer as a preservative against those maladies in grain so injurious to agriculture, and he was thence led to direct his whole attention to preparations with copper, and the salts derived from it, in the course of which, he obtained results the happiest and most satisfactory. Little did he imagine that the peasants of the Pays de Waes, and an intelligent farmer in Derbyshire, had anticipated him in his supposed discovery. The article which, on the whole, he prefers, is, the sulphate of copper, (copperas, or the blue vitriol of commerce), but verdigrise must be equally effectual.

His experiments in preventing the smut, which he tried in the fields with preparations of vitriol, presented the following results.

1. Infected grain, without any preservative, had one-third smutted.

2. Infected grain, simply scalded, gave one-fifth smutted.

3. Sound grain, without any preservative, gave one-fiftieth part infected.

4. Infected grain, well moistened in a dissolution of vitriol, containing that salt in the proportion of one ounce, six drams, $15\frac{1}{2}$ grains avoirdupoise, for every three bushels of wheat, gave one one-hundredth part smutted.

5. Infected grain, well moistened with vitriolated water in the proportion of four ounces, three drams, $14\frac{2}{3}$ grains avoirdupoise, to three bushels of wheat, gave only one three-hundredth part smutted*.

Its value for the prevention of smut, therefore, cannot be doubted; fortunately, it has been found equally effectual against the mildew.

Mr. Charles Vanhoorebeke of Ghent, and his predecessors, have for above fifty years occupied a druggist's shop, where they sold to the peasants as a preventive against the mildew, a composition, of which arsenic was the basis†. But being convinced by the success of Mr. Prevost's experiments, that a preparation of blue vitriol would not only be more effectual, but would obviate all the objections to which the use of arsenic was liable, Mr. Vanhoorebeke resolved to try it instead of the old composition, and a pea-

* These particulars regarding Mr. Prevost's experiments, are extracted from a work published at Lisle, called, "Agrostographie des Departemens du Nord de la France," par J. B. H. J. Desmazières, printed an. 1812.

† The composition, converted into the English standard, is as follows. White arsenic two pounds; alum three pounds, three ounces, three drams avoirdupoise (or use about two pounds of native sulphur), and four pounds, six ounces, and six drams of hot lime. About seven ounces of this composition is sufficient for one bushel, and one gallon of wheat, mixed with such a quantity of water, that the light grains may swim at the top.

sant in the commune or parish of d'Ertvelde, about three leagues from Ghent, named Francis Pauwels, having, in 1811, a field of wheat, the crop of which was entirely infected with mildew; and having brought to Mr. Vanhoorebeke a quantity of that mildewed grain, which he proposed to sow for the ensuing crop, Mr. Vanhoorebeke, without letting the peasant know the remedy applied, had the grain thus infected, prepared in the manner to be afterwards described, and the farmer sowed it in the same field that had formerly been attacked by the mildew. The result was most satisfactory; for the ensuing crop had not the least appearance of that disease. Since that time, Francis Pauwels has constantly made use of this remedy, and above 100 of the neighbouring farmers have followed his example with uniform success.

The following is the mode of preparing the grain by this new process, converted into the English standard.

Dissolve three ounces and two drams of sulphate of copper, copperas, or blue vitriol, in three gallons and three quarts, wine measure, of cold water, for every three bushels of grain that is to be prepared. Into another vessel, capable of containing from fifty-three to seventy-nine wine gallons, throw from three to four Winchester bushels of wheat, into which the prepared liquid is poured, until it rises five or six inches above the corn. Stir it thoroughly, and carefully remove all that swims on the surface. After it has remained half an hour in the preparation, throw the wheat into a basket that will allow the water to escape, but not the grain. It ought then to be immediately washed in rain or pure water, which will prevent any risk of its injuring the germ, and afterwards the seed ought to be dried, before it is sown. It may be preserved in this shape for months.

In regard to the use of copperas in England, it appears that Mr. Joseph Butler of Killimarsh, in Derbyshire, dis-

solves two pounds of blue copperas, in as much chamber lye as will wet twelve bushels of wheat, and after soaking, dries the wheat in quick-lime*.

That the nielle or mildew is either not in the soil, or if it is, that the application of copper preparations to the seed, prevents its injuring the plants, is proved by the experiment above detailed, where mildewed grain was sown in a field that had before produced it, and yet the crop produced by the mildewed seed, when subjected to the above preparation, was not in the least affected by that malady.

That it does not arise from fogs, rainy weather, dews, or great heat, is proved from this circumstance, that the disease can be discovered in the plant before it can possibly be affected by those accidents. It appears, indeed, from the evidence of Professor Balsamo of Sicily, that the disease is common to grain throughout the whole of that island, without exception of kind, of soil, exposure, or other circumstance, consequently that the opinion which attributes the mildew to fogs, or dews, or meteors, is erroneous. In Sicily it has often happened, that humid districts are exempted from it, when dry ones are infected, and that foggy seasons are not troubled with it, whilst, in a succeeding dry season, the grain is mildewed†.

That the malady depends upon the seed, and can be prevented by proper preparation, is proved by the following experiment, reported to me by the brother of Mr. Vanhoorebeke. Some peasants in the village of Steyne, two miles from Ghent, having to sow a field with wheat, had seven-eighths of the seed prepared with arsenic, in the proportion of two ounces per hectolitre, (about three English bushels), mixed with rain water. In consequence of that preparation, that part of the crop was not in the least affected with the mildew, or any other disorder, whilst the

* Derbyshire Report, Vol. II. p. 116.

† See Rees's Cyclopædia, voce mildew.

eightth part, which was sown without the seed being prepared, was much injured by that disease.

That preparing the seed with substances derived from copper, does prevent the mildew, is certain from the facts above detailed, and above all, from the experience of the Payes de Waes, where it is said to have been practised for ages.

Mr. T. A. Knight is of opinion, that the disease is taken up by the root, (every experiment to communicate it from infected straws to others, proving abortive); and that all we see externally is its fructification. This exactly corresponds with Mr. Prevost's opinion, that it is *an intestine parasitical plant*. Hence arises the probability that the root coming from a seed fortified against infection by preparations of copper, may resist the disorder, however much that root may afterwards be exposed to its influence.

In regard to moisture being the cause of the disease, it has been proved, that the seeds or gemmes of the parasitical plants, which occasion the smut, the rust, or the mildew, will all grow in water, or on wet cloths, and their growth in rainy seasons, is only a proof, not that moisture and warmth is the cause of the disease, but that it is more favourable than dry seasons to its progress, and will bring it out, if it exists in the plant. If indeed it did not exist in every plant, how is it possible to suppose, that a whole field should be infected *in the space of one or two nights*, as is known to be so frequently the case at present; whereas the idea that it exists in the seed, or the root, rationally accounts for the rapid progress of the disorder, where the grain is diseased, where the necessary precautions to prevent disease have been neglected, and where the season is favourable to its production. Such precautions must be executed with peculiar care, to prevent the mildew, as its seeds or gemmes are much smaller than those of the smut or rust, and consequently they require greater exertion to destroy them.

As to the barberry bush occasioning mildew, if that fact were admitted, which is much controverted, still it only proves that the disease may be propagated from one plant to another, but to a limited extent; and that a whole field cannot be infected with the disease, unless it is in the seed, or the root.

Fortunately also, the expence of this preparation is inconsiderable. The best French verdigrise, or acetate of copper, may be had at a colourman's for seven shillings per pound; and English verdigrise, which would answer the purpose equally well, for five shillings and sixpence. The price of blue vitriol is only three shillings and sixpence per pound.

On the whole there is every reason to hope, that all the maladies to which wheat is liable, can be prevented by care and attention, and at a moderate expence; and that one of the principal sources of scarcity in England, and one so fatal to its agricultural and general interests, may, in future, be completely obviated. There is at least a strong probability of success, by a careful attention to the above preparations, accompanied by the importation of a change of seed from the Continent, the advantages of which practice shall next be considered*.

* It is to be hoped that experiments will be tried on a great scale, at the public expence, to ascertain the best means of preventing diseases of so ruinous a nature to the nation at large, but to the farming interest in particular. An intelligent friend has recommended the corrosive sublimate, as likely to answer, if it is not injurious to the germ. I was assured on the Continent, that if a pound of salt were put into an English quart and a half of water, and a quantity of grain wetted with it, and if a pint of common oil were mixed with the seed, the future crop would be greatly benefited. It is singular, that Mr. Cleaver of Yorkshire, had a great crop of wheat, 44 Winchester bushels per acre, (country measure), which he attributed to steeping his seed in oil and salt. It was sown on turnip land as late as Candlemas, at the rate of three bushels and a half per acre. It is astonishing how many valuable facts are buried in the County Reports of England, which may remain neglected, unless brought to light by a *General Report* of the Agricultural State of the whole Kingdom, which would be a work of incalculable value.

II.

On the Advantages of a Change of Seed.

OUR culmiferous grains were originally much inferior to what they are at present. Selected in ancient times, by ingenious benefactors of mankind, whilst defective in regard to quality and produce, they have been improved, by cultivation, and farther selection, to their present standards of perfection. If, negligently cultivated, they would all again degenerate, and return to their originally wild state; and they have a tendency to degenerate, and are liable to become diseased, if without selection, they are always cultivated on the same soil*. Convinced, by experience, of the justness of these observations, attentive farmers frequently change their seed. By such changes, when properly conducted, they may increase the quantity of their produce†, they improve the quality of their grain; it becomes less liable to disease, and their crop is earlier ripened, if brought from earlier districts‡.

In Flanders, changing the seed is more regularly and systematically attended to, than in England. Mr. Hanolet of Fays, near Fleurus, who cultivates about 500 English acres, annually purchases from D'Armentiere, near Lisle, from twenty to thirty bushels of wheat, and by that means renews his seed every two years, sowing only from the produce of the new seed. The same plan he adopts in regard

* General Report of Scotland, Vol. I. p. 372.

† Gentleman Farmer, p. 327 to 336. Lord Kames calculates the increase at 26 per cent.

‡ Husbandry of Scotland, Vol. I. p. 355.

to rye and winter barley. He adds in his communication upon this subject; “by this renewal of seed, all the maladies of grain are prevented.” Some farmers bring their seed from Holland; and Mr. Art, at Genappe, is of opinion, that such a change, would have prevented the mildew, the only time when his crops were infected with it.

The diseases to which the wheat of this country is liable, I am convinced are greatly owing, to our having so long neglected a change of seed from foreign countries. Wheat is not an indigenous, but an exotic plant, and consequently must degenerate, if constantly sown in the same soil, and exposed to all the inclemency of a northern climate. Its stamina are thus gradually weakened, and it thence acquires a tendency or predisposition to various disorders, from which, in a better climate, and under judicious management, it is happily exempted. A change of seed from one farm to another, is found of use, but an importation of seed from a different soil and climate, where the diseases of these plants are unknown, must be still more advantageous.

Impressed with these ideas, I was extremely anxious to ascertain, where the best seed, both of red and of white wheat, and of winter barley, could be purchased in Flanders and Holland, and whether the seed could be procured in time sufficient to be sown the year it was produced. In Flanders, they uniformly maintain, that the seed of the year is preferable to old seed: and hence, without obtaining new seed, the experiment would not be fairly tried; but I think there can be no doubt, that by sowing the seed of the year, *properly prepared*, a superior crop would be obtained, without the smallest risk of mildew or any other disorder. A plan for that purpose has been arranged, and I trust will be extensively carried into effect in the course of the ensuing autumn.

So advantageous is a change of seed, that in the neigh-

bourhood of Frasnés and Fleurus, where that system is carefully attended to, in an account given of their crops for the last forty years, by a number of intelligent farmers in that neighbourhood, whilst they admit, “ that for six years during that period, the Plain of Fleurus had been ravaged by field mice and snails; and that all the farmers, without exception, had larger crops of herbage than of grain;” yet there is not the least intimation of their having suffered from the mildew, or any other disease, during the whole of these forty years. The mischief occasionally done by field mice, is, in some seasons, carried to an extent hardly to be credited.

In regard to the advantage of a change of seed, it has been found, that by crossing different varieties of wheat, the crops escaped mildew, though that disease was extremely prevalent, and though almost every district in the kingdom suffered from it that year. A complete change, however, is likely to be still more beneficial.

Are not these circumstances a decisive proof that the mildew is not in the atmosphere, otherwise how could it be prevented by a change of seed, or by crossing different varieties?

III.

On the application of Dutch Ashes, to improve the Crops of Clover, and the succeeding Crops of Wheat ; and on the importance, in other respects, of this species of Manure.

For a number of years past, the crops of clover in England have gradually become more and more deficient, and the crops of wheat sown after the clover, have frequently failed. It was supposed, that from too frequent repetition, the ground had become tired of clover, and that the same success in cultivating it could not be expected. The failure of the crop of wheat afterwards, was peculiarly unfortunate, and certainly greatly contributed to the scarcities which have of late prevailed in this country. I was much gratified therefore to find, that in Flanders, there were no complaints of the failure of the crop of clover, (except in one district, where a plant, called the orobanche, infested the ground), and that the crop of wheat, after clover, was reckoned among the surest of any. It was still more satisfactory to ascertain, that the means of obtaining similar results, were distinctly known, were not expensive, and could easily be procured in England, being nothing but the application of Dutch Ashes.

According to the best information I have hitherto been able to obtain, there are two sorts of turf or peat in Holland. The first is found on rising grounds, and in a sandy soil, at from three to twelve feet from the surface, the strata varying from eighteen inches to three or four feet in depth. This sort is principally found in Friesland. It is cut and prepared in the same manner as the peat of Scotland and Ireland, burns quickly and cheerfully, gives a good heat,

but leaves only a very light ash, of little value. The other sort of peat, which is more generally used in Holland, is extracted from the marshes, which are constantly covered, during the winter season, with water of a *brackish* nature; after this peat is reduced to a pulp, it is spread upon the ground, and when it has acquired a certain consistency, it is cut and dried in the same manner as the former. It burns less clear, and gives less heat than the other peat, but it lasts longer, and leaves a much heavier ash, full of saline matter, insomuch, that it is sometimes used as a substitute for soda, in the manufacture of green glass. This can only be accounted for by the effects of the water by which it is covered, which not only deposits a muddy substance, whence the richer part of the ashes is derived, but the water being of a brackish quality, it impregnates the peat with salts.

These ashes were analysed about 40 years ago, when it appeared that from one-ninth to one-twelfth part consisted of glauber and marine salts*. In a recent analysis by Professor Brande, of the Royal Institution, the contents of the specimen given him, were as follow :

Silicious earth,	32
Sulphate of lime,	12
Sulphate and muriate of soda,	6
Carbonate of lime,	40
Oxide of iron,	3
	<hr/>
	93
Impurities and loss,	7
	<hr/>
	100
	<hr/>

* See Memoires de l'Academie de Bruxelles, tome 3, p. 47, where there is a paper written by the Abbé Marci, read on the 13th December, 1775, on the subject of artificial manures, and stating the advantage of using these Dutch ashes, as being then well known.

In such an article, however, the variety of substances to be found in it, must be very great, and in different proportions.

In every part of the interior of Flanders these Dutch ashes are used for clover, and with a success hardly to be credited. They are brought to Brussels by a canal, and thence are conveyed, by *land carriage*, to the distance of from 50 to even 100 miles. Wherever they are used, there is no complaint of any deficiency either in the crop of clover, or of the wheat afterwards. Some instances of their success, it may be proper to specify.

Mr. Mosselman a great farmer at Chenoi near Wavre, assured me, that without the ashes of Holland, he could neither have a crop of clover, nor of wheat afterwards ; and that wheat after clover, *manured with Dutch ashes*, was the most certain crop of any.

Mr. Hanelot near Fleurus, declares, that he sows upon clover, 25 cuvelles of Dutch ashes per hectare, (about 19 bushels per English acre); that no manure, though it were to be given in greater quantities, and at more expence, would equal it in strength ; that after sowing these Dutch ashes, they always have two great crops of clover, besides pasturage afterwards, and that the next crop of wheat is not more injured by insects, than the other crops of that grain.

Observing a great heap of dung in a field near Baulet, I enquired of Mr. Grossjean, the farmer who accompanied me, what it was intended for. He answered, that it belonged to another farmer, who thought to render the use of Dutch ashes unnecessary, by spreading a great quantity of dung on his young clover, during the winter, and collecting it in the spring, to carry to another field ; but there was no comparison between the clover where the Dutch ashes had been applied, and the field that had been covered with

the dung, the former being much forwarder, and in every respect superior.

Mr. Vandoorslair, in the Pays de Waes, informs me, that this manure is used with great benefit, where clover is kept for a second year, whether for cutting or pasture, and its advantage, where that practice is adopted, would be incalculable, as the second year's crop is of little value at present.

It is unnecessary, however, to dwell more on individual opinions, when 83 practical farmers in the neighbourhood of Fleurus, have joined in a public declaration to the following effect. "All our farmers know by experience, that when clover is not manured at the rate of 25 cuvelles of Dutch ashes par bonnier, the following crop (of wheat) is very bad, notwithstanding any culture that can be given to the soil, whereas they always have an excellent crop of wheat after clover, and, doubtless, in proportion to the quantity of manure above mentioned being used." The farmers who have subscribed this declaration, must have been deeply impressed with the importance of these ashes, for, in general, they must have brought them from 40 to 50 miles, by land-carriage, from the wharfs on the canal of Brussels.

These circumstances astonished me more than any thing I had met with in the whole course of my excursion. The advantages of Dutch ashes have been long known on the Continent; and though it would be as easy to import them into England or Scotland, as into Flanders, it does not appear to have been ever thought of, or tried; and on my return to England, on the 22nd of April last, the crops of clover in Kent seemed to me from a fortnight to three weeks behind, in regard to maturity, and greatly inferior in point of produce, to those I had seen on the Continent; which I am persuaded was entirely owing to the use of these ashes.

Upon enquiring into the price of these ashes at Brussels, I found it was one franc fifty centimes par hectolitre, (about 5*d.* sterling per bushel); that it required 16 hectolitres (about 47 bushels) par hectare, containing rather less than three English acres. The quantity therefore is about eighteen or nineteen bushels per English acre, or from 7*s.* to 8*s.* besides the carriage.

Mr. Ferrier, the British Consul at Rotterdam, (whose ready attention to my enquiries I acknowledge with much pleasure), informs me, that the price at Rotterdam was seven stivers per 100 pounds, Dutch weight, and including all expences, that it would come to about twelve stivers, which at the present rate of exchange, is about 1*s.* 4*d.* per 100 pounds weight, delivered free on board. The freight per ton of 2240 pounds, would be about 2*l.* to London, and perhaps about 2*l.* 10*s.* to Leith. The expence, on the whole, would not probably exceed from 10*s.* to 15*s.* per acre, freight included.

Dutch ashes are used for various purposes, besides as a manure for clover. Some farmers spread them on the ground where they have sown turnips or carrots, passing a harrow over the surface, and thus destroying the insects which injure those plants. These ashes are likewise sown on rye in October, on wheat and pasture lands as well as on clover in April, and on oats and beans in May. They are of great use to pease, but they render the grain harder, and more difficult to boil. In gardens they are used with much advantage, scattered over the surface, after the land is sown and raked. They are also good for hops, a handful being given to each heap. When applied to grain they promote its early growth, but are principally useful by increasing the quantity. They are in general sown by the hand, like grain, but care must be taken to leave no part of the surface without its just proportion. A still hazy morning is preferred for this ope-

ration, lest the wind should blow them away, and prevent their fixing on the soil and plants in the manner intended. The change which these ashes cause on the clover, is perceptible in the course of a week, and it is known, *from repeated experiments*, that without this precaution, vegetation has suffered so sensibly, that in some cases a crop of clover has been lost, and in others, has become less abundant*. Among the other advantages of these ashes, it is said, that they not only bring with them the principles of fertility, but that they are also well calculated to hinder the multiplication of all sorts of worms and insects (hence they may prevent the ravages of the turnip-fly or beetle), to destroy the mosses and lichens, which injure our pasture lands, and to protect the wheat from several maladies to which it is exposed, in particular the nielle or mildew; and perhaps the exemption of Flanders in so great a degree from these maladies, is partly owing to the abundant use of those ashes.

No time was lost in transmitting orders to Rotterdam, to send over a quantity of them, that some experiments might be tried in the course of this year, and in about a fortnight from the time that the orders were given, eight barrels arrived in the Thames, so easy is it to obtain them. Enquiries also shall be made, whether there is any likelihood of procuring a similar sort of ash in Lincolnshire, Cambridgeshire, or other parts of the united kingdom†.

When completely analysed, perhaps we may be enabled to procure an artificial compound manure, equally efficacious; or it may be found that clay ashes, now so successfully employed by Mr. Craig of Cally, Mr. Boyd of Mer-

* Communications to the Board of Agriculture, Vol. I. p. 242.

† It appears by the analysis of the turf, (whence the Dutch ashes are derived), by the Abbé Marci, that the salts are found in the bituminous parts of the peat; and fortunately great quantities of peat, full of bitumen, are to be found in the Hebrides.

ton-ball, and other spirited agriculturists in Wigtonshire, may, in some respects, answer the same purposes.

Mr. Young informs me, that whilst the crops of clover were abundant, the succeeding crops of wheat were equally good. If, therefore, by the use of these ashes, our former crops of clover can be restored, a double advantage will be obtained. The saline substances in the ashes, may also contribute to destroy the wire-worm, and in that way may protect the crops of wheat from injury.

In a celebrated experiment made in France, wheat sown after a moderate crop of clover was indifferent; after fallow was good, but after a great crop of clover that had been gypsumed, it was, in the language of the report, *superb*. The reasons are obvious. No insect can exist under so suffocating a crop as an abundant one of clover; and the roots of the clover, when abundant, furnishes a great quantity of manure for the wheat. It ought to be a rule in farming, to sow oats after a moderate crop of clover, but wheat after a large one.

I do not know any means by which so great an improvement can be so rapidly, and so generally introduced, and at so moderate an expence, as by the importation of Dutch ashes; and it gives me particular pleasure, that it is likely to promote, in a peculiar degree, the interests of the spirited and intelligent farmers of the county of Norfolk, to whom this species of manure is fortunately so accessible.

In Switzerland, and other countries where these ashes cannot be had, they make use of gypsum, or the sulphate of lime; but from the best information I have been able to obtain, there is no comparison between the two articles, the Dutch ashes being greatly superior, and much more certain, the effects of gypsum being precarious.

In some parts of England, as in Hertfordshire, Bedfordshire, &c. they use peat ashes, and even fermented peat dust,

for their clover and other crops ; but these ashes, when analysed by Dr. Pearson, principally consisted of green vitriol or the sulphate of iron, and were best adapted for chalky soils*.

* See a valuable paper written by Dr. Pearson on this interesting subject; Communications to the Board of Agriculture, Vol. IV. p. 319, 320, &c.—When Dutch ashes are applied to preserve turnips from the fly, the ashes should be sown either broadcast, or on the surface of the top of the drill, according to the mode of culture. There is reason to hope that this plan will protect the young turnips from the attacks of the fly. Powdered rape-cakes may also be tried, more especially if mixed with urine.

IV.

On the application of Rock Salt, as an effectual Preventive against the Rot in Sheep, and for other useful purposes.

IN visiting Mr. Mosselman, who occupies a large farm at Chenoi, beyond Wavre, I was surprised to find a quantity of rock salt from Cheshire. He assured me, that the use of it was of the greatest advantage to him in three respects.

1. That by allowing sheep to lick it, the rot was effectually prevented. 2. That his cattle, to whom lumps of it were given to lick, were thereby protected from infectious disorders, and the cows being thus rendered more healthy, and being induced to take a greater quantity of liquid, gave more milk; and 3. That a small quantity pounded, was found very beneficial to horses when new oats were given them, if the oats were at all moist.

It is certain that salt might, in various other respects, be of great use to agriculture, as mixed in dung-hills, strewed over hay damaged in harvesting, &c. But this simple mode of giving it to sheep, by allowing them to lick lumps of salt as dug out of the mine, and thereby preventing the rot, when they were fed on wet pastures, struck me much, from its cheapness and simplicity. There can be no valid objection to license farmers to use a certain moderate quantity of *rock salt*, for agricultural objects, because, from its being mixed with other substances, and unrefined, it is not at all likely to be employed for domestic purposes, and consequently to injure the revenue. The case would be otherwise, if *refined* salt were necessary. These lumps of rock salt might be kept in troughs, protected against the rain by covers in the fields, but accessible to sheep or

cattle. It is certain that salt prevents the injury done to stock by moist food, and consequently would be of great service to horses, when potatoes are first given to them. It is not improbable that it cures the rot, by killing the flukes found in the livers of sheep when infected with that disorder*.

A patent has been obtained by Messrs. Martin and Co. for a peculiar mode of preparing salt in large cakes, by which it is rendered far less disposed to melt and waste by the rain, than the native rock salt dug in Cheshire, and it may answer this important object of preventing the rot, if it is not found too expensive. Ingredients like quassia might be thought of, that would render its use for domestic purposes impracticable†.

* The natives in India consider salt almost as necessary for their domestic animals as food, and that a due proportion of it is essential for health. They give it to their bullocks, in general, daily, to the amount of from two to three ounces, mixed with their feed of pulse. To sheep they give it at least once a week, coarsely powdered if it is rock salt, and thrown down to them, either on a clean spot of ground, or on a coarse cloth or blanket. They eat it with the greatest avidity. Salt is also given to horses in the hot season of the year, to keep them in good condition, and certainly with the best effects. If given to race-horses, it might render so many violent purges unnecessary.

† This salt was exhibited at Lord Somerville's Cattle Show, an. 1814. (See Agricultural Magazine, Vol. III. p. 198).

V.

On a Diminution of Fallows, and the Course of Crops favourable to that Object.

FALLOWS are totally abolished in several districts in Flanders, but not in all. In the neighbourhood of Bruges, for instance, the following rotation is adopted on strong lands:

- | | |
|-------------------|-----------|
| 1. Fallow, | 4. Wheat, |
| 2. Winter barley, | 5. Oats. |
| 3. Beans, | |

Sometimes also they have a fallow every fourth year, and sometimes wheat and fallow alternately. Fallows, however, have been almost entirely extirpated in the Plain of Fleurus, in the Walloon country: and the history of that important event, which is only of recent date, cannot be too generally known.

By the system of cultivation adopted in that fertile district, fallows were enforced by the leases granted to the farmers; but a native of Flanders, Mr. J. B. Mondez, who had paid particular attention to Flemish husbandry, having taken the farm of Baulet, near Fleurus, stipulated, that he should be at full liberty to cultivate it on a different plan. Although fallows had been so long practised there, he found the ground full of root-weeds, for the thorough extirpation of which a fallow was necessary: but ever since that time, which is now a period of about 40 years, fallows are admitted only to a very inconsiderable extent, either on that farm, or in the neighbourhood.

Mr. Mondez has fortunately published an account of his operations, addressed to the Agricultural Society of the Department of Jemappe, by whom 600 copies of his paper were ordered to be printed, and a commission was appointed, to examine the facts stated by the Author, and to ascertain their authenticity. The result of that investigation was most satisfactory. It was proved that fallows were abolished, not only on his own farm, but, after his example, in the neighbouring districts, and that he had not only abolished fallows, but had in other respects brought the Agriculture of his neighbourhood to great perfection.

After reading his publication, it seemed to me so interesting, that I resolved to visit a farmer who had done so much public benefit. From the profit of his farming he has been enabled to purchase a valuable estate near Frasnes, where he resides. Being Mayor of that district, which is at no great distance from the frontiers of France, and his mind being distracted at the time, by a load of business, and the apprehension of a speedy invasion, he could not enter so fully as I could have wished, into agricultural discussions; but he promised to send me a copy of his paper, improved by all the corrections and additions which might be necessary, together with answers to several questions which I left with him. As the result of the experience of a farmer so active and intelligent, who has practised husbandry for above 50 years, must always be of great use, I propose having his communication, (when it is received), translated into English, as a work likely to be acceptable to British Farmers.

Thinking it would be of importance to examine the farm of Baulet, which he had let to another, after cultivating it himself for about 40 years, I went from Brussels to Fleurus on purpose to examine it. This excursion was made to great disadvantage, the whole country being full of Prussian soldiers, who were quartered on the inhabitants. The

Sieur Gross-jean, the farmer who had succeeded Mr. Mondez, was a plain practical husbandman, who found it for his interest to adopt, as closely as possible, the system of his predecessor. The price of manure however having increased, he thought it right to cultivate less flax or rape, and he had a small portion of his farm in fallow, but only at the rate of three, out of 107 bonniers.

The praises which Mr. Mondez received, excited the jealousy of those who resided in his neighbourhood, and an answer was printed, subscribed by 83 farmers, in which Mr. Mondez's publication was very severely criticised. The controversy has not yet ceased, and as it is carried on by persons of intelligence and ability, there is reason to hope that much useful information will be derived from the discussion, and that some important facts will thus be brought to light.

In regard to a course of crops that would render fallows unnecessary, various rotations are practised or recommended in Flanders. Mr. Mondez's system is,

1. Winter barley, or winter wheat;
2. Rape, or colsat, for seed ;
3. Half wheat, half rye;
4. Clover;
5. Oats ;
6. Flax.

Or, where flax is not cultivated, the following course is proposed :

- | | |
|------------------------|------------|
| 1. Winter barley, | 3. Wheat, |
| 2. Rape, transplanted, | 4. Clover. |

Or, 1. Winter barley,	3. Wheat,
2. Beans,	4. Clover.

Where rape is not approved of, the course might be,

1. Winter or spring tares, mixed with rye and lentils,
2. Wheat,
3. Clover,
4. Oats,
5. Beans,
6. Wheat.

As soon as the beans are cut down, they ought instantly to be removed to a field of grass or stubble, to dry, that the land intended for wheat may be immediately prepared.

The culture of beans, instead of a fallow, has been carried to the greatest perfection, by Mr. Wieland of Westkerke, near Ostend. After preparing the soil in the preceding autumn and beginning of winter, the dung is placed in furrows, as if for turnips or potatoes, and the beans planted over it, at the distance of about twenty-two English inches between each row. The beans are thoroughly horse-hoed and hand-hoed, the crop is certain, and the produce is at the rate of from eighteen to twenty for one. The following crops of wheat, or of winter barley, are excellent, and with this culture, fallows are unnecessary. Mr. Wieland adds, "This system merits to be encouraged, from the great advantages derived from it; for without any additional manure (which, however, it tends to furnish), it retains the fields in as high a state of fertility as can be done by the fallow system, it exacts but a moderate degree of attention, and it requires neither any extraordinary expence, nor hazardous combinations."

Mr. Wieland prefers the large bean. The small sort he thinks only fit to be sown with vetches. To those who are apprehensive that their climate is too late for the bean husbandry, to be followed by winter wheat, or barley, it may be proper to observe, that in some parts of the Netherlands, beans are raised *for forage merely*. They are cut soon after the

flower is formed, or a little later, and either given green to hogs, who are peculiarly fond of them in that state; or dried and given to sheep, to horses, or to fattening cattle. In this way, a great number of stock may be fed, and a great quantity of manure obtained, instead of a naked fallow, and the ground may be thoroughly prepared for the ensuing crop.

It is certain that fallows, executed in so masterly a manner as they are in the Lothians, are an admirable foundation for a course of crops. At the same time I am inclined to think, from what I saw in Flanders, that a fallow is not necessary so frequently as every sixth year, even on strong soils, if they can otherwise be cleaned and pulverized, which I am convinced may be effected. It has been ascertained, that after a fallow, wheat produces at the rate of only $12\frac{1}{2}$ per seed; whereas its produce after rape or colsat, is $13\frac{1}{2}$ *, and that the crop is not so liable to be affected by the mildew†.

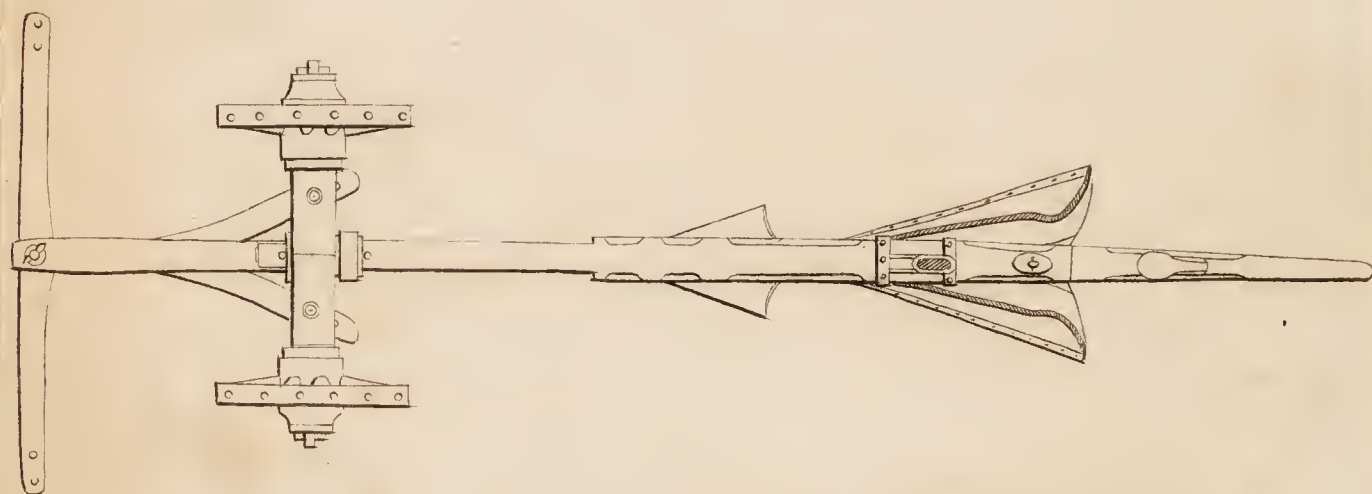
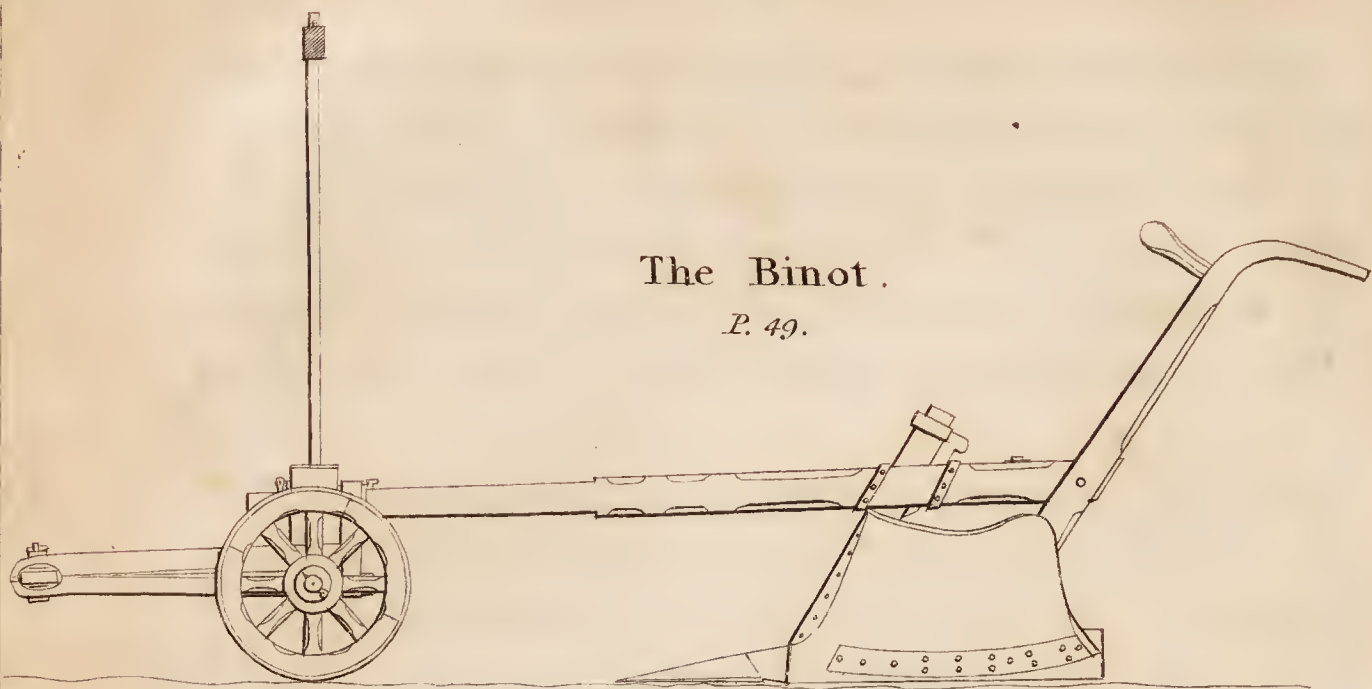
The advantage of cultivating rape, or Swedish turnips, *for seed*, where any doubts are entertained of rape answering, shall be afterwards explained; but on the subject of mere fallows, it is proper to consider, whether the great object for which fallows are adopted, may not be secured, without losing the crop of one year, which renders it necessary to exact a higher price for the productions of other years, in order to indemnify the farmer.

The great object of a fallow is, to clear the ground of root-weeds, and it is now completely ascertained, that this can be effected, *even on such extensive farms* as those in the Walloon country, by elevating the land into small ridges, that it may be more quickly dried, and more easily weeded,

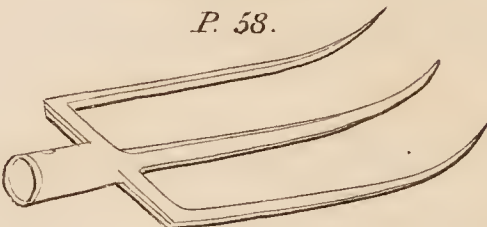
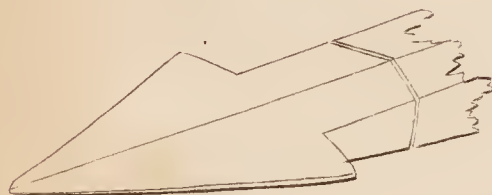
* Communications to the Board of Agriculture, Vol. I. p. 229.

† Husbandry of Scotland, second edition, Vol. II. Appendix, p. 153.

The Binot.
P. 49.



The Trident.
P. 58.



Scale of Feet



which they accomplish by means of an instrument called the *binot*, an engraving of which is annexed. In some respects it resembles a plough with a double or scuffler share, and two mould-boards, but it has no coulter. It is not a dear instrument, at least the one I purchased in the Netherlands, to send to England, for the inspection of the Board of Agriculture, cost me only 60 francs, or 2*l.* 13*s.* 4*d.* sterling, but then it is very coarsely made. Some farmers have three binots to eight ploughs, of different sorts, some two binots to five ploughs, and some two binots to four ploughs. Only one ploughman and two horses are employed. It can be made to plough to different depths, but in general, the furrow is from five to six inches. Such is the importance of this instrument, that I was informed by several most intelligent farmers, it was not in their power to cultivate their land without it, at least to the same degree of perfection.

In the Walloon country, in almost every case, the land is broken up, either in autumn, winter, or spring, by the binot. If the soil is foul, they employ it two or three times, for the purpose of cleaning it thoroughly. By means of this instrument the land is not turned over, as by the plough, and the weeds buried, but the soil is elevated into small ridges, by means of which the couch and other root-weeds are not only cut, but they are exposed to the frost in winter, and to the drought of spring, and when the land becomes dry, which it does quickly when thus elevated, these weeds are collected by the harrow, by a trident, (or large pitch-fork), by a rake, or by the hand; for weeding is an operation on which no expence is spared in the Netherlands. Root-weeds, when thus collected in the dry period of the spring, are either burnt, or mixed in a compost with hot lime. After the binot, the land is always ploughed for the seed furrow.

In addition to this important advantage, even the heaviest

land is rendered tender and friable by these operations, and loses that hardness, which clayey soils are apt to acquire after having been long cropped, without being occasionally completely pulverized.

Another advantage attending the binot is, that it is less expensive in its operations. Using it once, is not only equal to two ploughings, but the binot goes over a greater extent of land in the same space of time, and with the same strength of cattle. The saving of even one ploughing is of great importance, as, on an average, it cannot be stated at less than 12s. per acre in England, and 10s. per acre in Scotland; but in many cases, by the use of the binot once, two ploughings might be saved.

The binot has also been found of great use in the first breaking up of waste-land, not incommoded with stones, and in raising a crop of potatoes.

The above account of the advantages of the binot, was transmitted in French, to some intelligent farmers in Flanders, who entirely approved of it. Its shape has been greatly improved by an ingenious artist in this country*, and I have no doubt of its becoming a most valuable addition to our instruments of husbandry.

It is proper to add, that after the binot has been used, the land is always ploughed, preparatory to the seed being sown, and if that were done by means of a box attached to the plough, as recommended by Mr. Small, of Edinburgh, the seed would be sown in drills, by which the land might be more effectually cleared of weeds, and more thoroughly pulverized. Perhaps after using the binot once, and harrowing the land thoroughly, so as to smooth the surface, the grubber, or scarifier, might be used with great benefit, to com-

* The improved binot may be had at the manufactory of Messrs. Cooke, Fisher, and Co., at their Agricultural Repository, Winsley-street, opposite to the Pantheon, London. The price five guineas.

plete the process of pulverizing the soil, and clearing it of weeds. But raising the soil at once, as is done by the binot, at so small an expence of time or labour, and elevating it so as to be rendered soon dry, and fit for being harrowed and wed, seem to me highly advantageous.

I met at Brussels a very intelligent gentleman from Switzerland, the Colonel de la Chaux, who is a member of the Agricultural Society of Lausanne. He informed me, that the Swiss farmers have totally abolished fallows. Their favourite rotation on a medium soil is, 1. Wheat; 2. Carrots; 3. Vetches, or a small pea called poisette; 4. Barley; and 5. Potatoes. When they grow clover, they have a peculiar mode of preparing the seed. It is steeped for an hour or two in common oil, which prevents the attacks of insects, to whom oil is a poison; it is then mixed with powdered gypsum, which promotes the germination of the plant, and by these means they are able to obtain, even the first year, one good cutting of clover. It is cut twice the second year; it is then slightly dunged, and the third crop is ploughed in for wheat. This plan of using oil and gypsum, may be a beneficial practice with other seeds, besides clover, as with turnip-seed, &c. The Baron de Serret informed me, that by reducing rape-cake to a powder, and strewing it on the surface, mixing it afterwards with the soil by a plough, a harrow, or a rake, he destroyed the taupe grillo (grillon-talpa), an insect so injurious to kitchen gardens; and he is persuaded that all the vermin who have the same system of respiration with that insect, might be extirpated by the same means. It is not improbable, indeed, that the great quantities of rape and other cakes, used in Flanders as manure, may contribute to preserve their crops from the depredations of insects, and this is a subject therefore, which is earnestly recommended to the attention of British Farmers.

On the subject of fallows, it is only necessary to add, that

it is now a maxim in the Plain of Fleurus, where fallows are almost entirely abolished after a considerable struggle, that whenever it is possible to manure the land fully every ninth year, they are perfectly unnecessary. Indeed by abolishing fallows, the requisite manure is procured, from the crop thereby obtained, so that it is only the difficulty of the first year that is to be surmounted. The importance of this subject is immense. There are in England about 2,200,000 acres in fallow every year, and 200,000 in Scotland. Let these extensive tracts of valuable land be rendered productive, and there is an end at once to all our agricultural distresses*.

* Mons. de Burtin of Brussels, has written a short but interesting paper on the abolition of fallows, which he distributes amongst his friends. He strongly recommends endeavouring to alter the texture of the soil, by mixing sand with it, or burning clay in great heaps, to be employed for the same purpose. He informed me, that in the country of Luxembourg, they leave a great stubble, and when it is dry, they cover it by two furrows, and then burn the soil and stubble, with a smothered fire.

VI.

On Weeding.

It is hardly possible to conceive how much attention is paid by the Flemish farmers to the weeding of their land; and as they know nothing of the drill husbandry in the culture of grain, they are at a great expence in keeping their land clean by manual labour. In their best cultivated districts, their exertions are incessant, and frequently from 20 to 30 women, and sometimes more, may be seen employed in one field, kneeling, for the purpose of greater facility in seeing and extracting the weeds.

In the Pays de Waes they use the *trident*, or *fourche a trois dents*, (See Engraving, No. II.), for tearing up the weeds, digging the whole field with that instrument; but that is only done in light soils. The teeth of the *fourche* are about a foot long. It is stated to me on the most undoubted authority, (that of Mr. Vandoorslaire of Waes-Munster), that in the Pays de Waes, they use the *trident* after every crop, and after every cutting, both of the first and of the second crops of clover, and that the weeds are not only taken out, but that the crop of clover is benefited by the operation. This is particularly attended to, when the clover is kept for a second year.

In regard to strong land, the *trident* is particularly useful for breaking the clods when they become dry, thus enabling the root-weeds to be gathered, and facilitating the pulverisation of the soil.

Another advantage attending the collecting of weeds by hand labour is, that when executed in the spring, these weeds, particularly when boiled, are much relished by

milch cows, when green food is so difficult to be had; and the farmers in the neighbourhood of Sombrefte, and in other parts of Flanders, get their lands weeded by the children of the neighbouring cottagers, solely for the privilege of procuring these weeds for their cattle, and thus converting a nuisance into a benefit.

On this subject it is only necessary to add, that where such enormous sums are bestowed on the maintenance of the poor, even in country parishes, why not employ them in weeding the land? It would not be expensive to furnish the men with tridents, by means of which the quantity of root-weeds might be greatly diminished, both on strong and on light soils; and the women and children ought to be constantly employed in cutting down, or in rooting out every weed that makes its appearance. A law requiring overseers in country parishes, to attend to this object, would be a most essential public benefit. In light soils also, the plan of trenching the ground, according to the usage of the Pays de Waes, might be adopted with great advantage. Such soils are thus rendered more capable of retaining moisture, which, though deep, will be brought up to the roots of the plants by the process of evaporation. It is sufficient to trench the land every seventh year, and it is not a very laborious employment, as practised in that district. The instrument used is a light shovel, and not a spade. After a trench is made, the labourer stands in the trench, and with a shovel takes off seven or nine inches of the top, which he throws into the bottom of the trench, and as many inches of the bottom, which he throws to the top, reversing the whole soil. Would it not be much better to employ our labourers in this important operation, than to maintain them out of the poor-rates, without giving them any thing to do, for the money they receive, even in country parishes?

VII.

On Winter Barley.

IN Flanders their crops of barley are in general sown in autumn, or the beginning of winter, and are hardy enough to withstand all the severities of that period of the year. One variety, there called *sucrion*, or *escurgion*, (the bear or big of this country), in consequence of this mode of culture, weighs heavier than the two-rowed or spring barley, sells at a higher price, and is more sought after for making beer. I am thence inclined to think, that it would be advantageous to cultivate that sort in this country, in the same manner, more especially as it ripens so early, (about the middle of July), when sown in autumn, and consequently would furnish an early and valuable resource in times of scarcity. It has been tried in England, on the system of autumnal culture, but more with a view of feeding sheep in spring, than of cultivating it for a crop*. In Essex, where they

* Mr. Ellman, of Glynde in Sussex, informs me, that in winter, they sow only the four-rowed, which weighs about the same as the spring, or the two-rowed barley. It has been cultivated in Sussex for above twenty years, principally for sheep-feed, and rarely for a crop, except to raise seed. Sheep are fed on it, in the months of April and May, and when fed even to the middle of May, six quarters have been grown per statute acre. Sometimes it is fed till the latter end of June, when it is ploughed up, and the land, after being manured, is sown with rape or turnips. If not fed, the produce is reckoned rather more than spring barley, but the maltsters will not give quite so much for it. Mr. Ellman has discontinued the practice of growing it, and cultivates rye for the same purpose, as it comes a fortnight earlier to feed, produces more food in March and April, when it is so peculiarly valuable, and the succeeding crops of corn are better after rye, than after winter barley. At the same time, he adds, it is an excellent food for sheep, and they prefer it to rye.

sow their fallows with barley, as long as the fallow system continues, they would certainly find the culture of winter, preferable to that of spring barley; and they might procure either the two or the four-rowed barley, as they wished, for the two-rowed barley is likewise sown in autumn, and habituated to that culture. Scotland and Ireland might thus produce barley, nearly equal to that of England, for it would ripen in the warm season of the year, and would be harvested in good weather.

VIII.

On the Advantages of Flax Husbandry.

PREVIOUS to the year 1774, fallows were enforced, and the culture of flax and rape was prohibited, by the leases granted to the farmers in the Plain of Fleurus, as destructive to the fertility of the soil. Mr. Mondez was the first who proved the absurdity of that doctrine, and who introduced the cultivation of plants producing oil, the crops of which were more valuable than those of grain, whilst by raising a productive article, instead of a naked fallow, the farmer was enabled to sell his grain, in the course of a rotation, at a cheaper rate than otherwise he could afford it. Even on soils of a clayey nature, flax was raised successfully, unless where the clay was mixed with red sand. It certainly requires great attention on the part of the farmer, particularly to the weeding of the crop, but all the other operations are now greatly facilitated by the improvements introduced by Mr. Lee, in the preparation of the flax for being manufactured, and it is thus rendered perhaps the most advantageous production that the soil can furnish.

Flax husbandry is carried to the greatest perfection in the neighbourhood of Lisle. Land that has carried a crop of wheat or oats, after clover, is there preferred. The land must be thoroughly pulverised by repeated ploughings, harrowings, and rollings, and manured with rape-cake or night-soil; it is considered to be a scourging crop, but it may be raised every six years, without injury to the soil. Indeed as Mr. Wieland justly remarks, in a communication upon that subject, “ the crops of lint and rape may exhaust

the soil when they are too frequently repeated, but there is no reason to apprehend such a result, where attention is paid to the collection of manure, and to judicious rotations: the experience of many ages proves, that the prohibition of these rich productions is not necessary to preserve the fertility of the soil." Another most intelligent farmer (Mr. Hanolet), observes, "That in many respects the culture of flax is advantageous; that it sells at a high price; that the soil in which it is grown is completely cleaned of weeds in the course of the culture; and that the succeeding crop, whether wheat or rye, is better than after fallow." Can there be stronger arguments in favour of any article being extensively cultivated?

The superiority of a manufacture founded on a domestic production like flax, over one where the raw material is imported from a foreign country, is proved in so satisfactory a manner, in a paper drawn up at my request, by an intelligent gentleman of Ghent, Monsieur Hys Schoutheer, that I have much pleasure in referring the reader to that interesting communication (see Appendix, No. VI). By the cultivation of flax, agriculture and manufactures support each other. In the Pays de Waes, every farmer can afford to keep more servants than in other countries, whose assistance in critical periods of cultivation is so essential, from his being enabled, at other times, to employ his servants in the various operations connected with flax husbandry, and its manufacture afterwards. In the neighbourhood of Lisle, the result is in the highest degree important. In two small districts in that neighbourhood, there are 40,000 wheels employed in spinning coarse, and 10,000 in spinning fine threads; there are above 7000 weavers of cloth, as many of cambric, 300 for table linen, and 750 for matrasses, making in all 15,000 weavers, beside the spinners.

The improvements effected by Mr. Lee, of Old Ford,

near Bow, in Middlesex, render it still more desirable to promote the cultivation of flax in this country. By his mode of preparing that valuable production, all the trouble and hazard of steeping and drying it, are not only rendered unnecessary, but a finer and stronger material is got, and a considerable quantity of food for cattle, and manure for the soil, is obtained. The following is the calculation which Mr. Lee has given of the profit to be derived from this crop.

Expence per Acre.

	£.	s.	d.
Rent of Land, and its manure,	5	0	0
Ploughing and harrowing	1	10	0
Sowing, harrowing, and rolling	0	7	6
Weeding by hand	0	15	0
Pulling and setting up	1	0	0
3 Bushels of seed	1	11	6
Cartage, stacking, &c.	1	0	0
Thrashing out the seed, and cleaning the Flax to a state fit for the market	8	10	0
	<hr/>		
	19	14	0
Profit	18	7	6
	<hr/>		
	£38	1	6
	<hr/>		

Produce per Acre.

	£	s.	d.
10 Cwt. at 60s.	30	0	0
9 Bushels Seed, at 10s.	4	10	0
Chaff	1	11	6
Manure obtained according to the new system,	2	0	0
	<hr/>		
	£38	1	6
	<hr/>		

When it is considered, that besides the profit above stated, which is more than double the usual produce of grain crops, and the high rent given, that great numbers of people might be employed in all the various branches of the manufacture, and the poor-rates thereby reduced; one may form an idea of the advantage that may be derived, by a general adoption of this culture. It is quite a mistake to suppose that valuable land is necessary for this crop. Under proper management, light soils would produce it in abundance and perfection, provided the land for the previous crops were properly dunged, and rape cake sown with the flax. It will likewise appear, when the subject of double crops is discussed, that it is possible to sow crops with flax, which will furnish a considerable quantity of manure in the same year, and thus the strongest objection to the culture of that plant is obviated.

It may be proper to add, that one of the most intelligent Agriculturists whom I met with in Flanders, Mons. Vanderfosse, stated, that the profit derived from the culture of flax, greatly tends to diminish the price of grain. The necessity of having dung in abundance, obliges the farmers to sow grain, even when the price is low, in order to procure straw to be converted into manure, that they may be enabled to raise their flax. The high price of grain therefore, in this country, is partly owing to the culture of flax being neglected; for, with the profit of that crop, farmers could afford their grain cheaper. Indeed in the Pays de Waes, the sale or price of grain, is considered by the farmers as only a secondary object; and it is hardly possible for a *mere corn farmer* to stand a competition with such rivals.

Crops of rape and flax, when properly intermixed, in judicious rotations, with those of grain and pulse, likewise

tend to preserve the soil in that properly balanced state of fertility, neither too rich, nor too poor, which is favourable to the production of sound grain, and to prevent those disorders and risks to which it is liable, when the crop is too luxuriant.

IX.

On the Culture of Rape, or Cole-seed.

IN the Plain of Fleurus, prior to the year 1774, the culture of rape for seed was prohibited, as it is now in England by the generality of leases; but happily for that country, that ancient prejudice has been removed. Mr. Mondez assured me, “that he always had better crops of wheat after rape, than after fallow; the straw was not so abundant, but the grain was superior, in respect both of quantity and quality.” The nature of that culture I shall endeavour briefly to explain.

The plants of the rape are raised on a small quantity of ground that has been fallowed, well dunged, and been cultivated five times by the binot or the plough. They sometimes also raise these plants on land after the first cutting of clover. It must be thoroughly pulverized, and manured. The rape is then transplanted into a field, that had formerly produced winter-barley, or winter-wheat. It is first cultivated by the binot, then by the plough, and the young plants are put into the ground, either by a dibble, or by the plough. The first method produces the greatest crop, but it requires skilful hands to execute it. The second is the least expensive, and the most expeditious. The advantages of this culture are very great, and more profitable than consuming the rape by sheep. In a small circle round Lisle, there are 450 windmills, for extracting oil, from the seeds produced in that neighbourhood.

In the year 1810, the produce was estimated as follows:

	<i>French Money.</i>		<i>English Money.</i>
1. 180,000 hectolitres of oil, at 109 francs each }	19,620,000	....	£817,500
2. The cakes valued at } one-sixth part	3,270,000	....	136,250
	<hr/> 22,890,000<hr/>	....	<hr/>£953,750 <hr/>

Why should the farmers of England be prevented from raising so valuable an article, which would be so useful in the course of a rotation, when two successive crops of grain ought not to be permitted? It is absurd to suppose, that under a judicious system, cultivating it only every sixth year, and with proper attention to the collecting of manure, the land will be exhausted. When the rape is transplanted, the crop only occupies the ground one year, and thus a fallow is prevented; and a crop of wheat after cole-seed, is not only more abundant than after fallow, but the quality is better.

It is proper to observe, that cole-seed is not a certain crop, being sometimes injured by frost, and at other times by insects. Fortunately, however, there is a plant, of a hardier description, and equally valuable for the production of oil; I mean the Swedish turnip. There is reason to believe, that it would yield as much seed per acre; and although the grain is smaller, it sells at the same price as rape seed, and produces as much oil. It can also be transplanted like rape, and on the whole, its culture seems to promise greater advantages.

It is necessary to add, that to encourage the culture of these oily plants, it would be desirable to prohibit the im-

portation of foreign seed, unless the price rose to at least ten shillings per bushel. The culture of these profitable articles might otherwise be checked at the commencement; and it is evident, that the higher the profit of these crops, the lower is the rate at which grain could be afforded.

X.

On Manures.

THE Flemish farmers are peculiarly distinguished by their great attention to manure. It is a principle with them, that the fertility of the soil entirely depends on the riches you give it, and that a farmer cannot be too attentive to the collection and application of this source of wealth. The more opulent farmers likewise, pave, and line with bricks, the receptacles for their dung, which is thus kept constantly plunged in a mass of liquid matter. The fibrous parts of the vegetables are in this way completely decomposed, and four tons of this manure, go as far as five, collected and kept with less precaution*.

The following is a list of the manures made use of in the neighbourhood of Lisle.

1. The dung of cattle and horses, with the straw;
2. Ashes; 3. Lime; 4. The urine of animals, collected with care in brick cisterns; 5. The cakes of rape and hemp seed†, reduced to powder in a mill, and which is sometimes thrown into the urine cisterns. This last sort of manure, on account of its strength, is scattered about in small quantities, fifteen days before the seed is sown, that it may not prove injurious to the plant; 6. The sour water obtained by washing the tubs of starch-makers. This is considered to be a very weak manure; 7. The urine of cattle fattened at the distilleries, which is reckoned worth five pence per hectolitre; 8. The dung of pigeons; 9. That of sheep, gathered

* Communications to the Board of Agriculture, Vol. I. p. 238.

† Cakes of flax seed are destined for feeding cattle and sheep.

by young children along the sides of the roads; 10. Street dung; 11. Marle; 12. The refuse of horns, a manure as effectual the second as the first year; 13. Night-soil purchased from scavengers. The price of this article is, threepence to the scavengers per ton, and twice as much to the inhabitants of the country. A waggon load of this matter, drawn by three horses, costs only twelve francs, or 10s. sterling. The town of Lisle, however, alone produces as much of this sort of manure, as would sell for about 4200*l.* a-year. The night-soil of an hospital there, containing 1800 souls, is let for 3300 francs, or 137*l.* 10s. per ann.

In order to increase the quantity of manure, not only horses, but cattle, and even sheep, are kept in stables during almost the whole year; and that nothing may be lost, the stables and cow-houses are washed with water, which is conveyed into cisterns, or thrown into the dung-hill.

Great attention is also paid to cover the dung. When it is spread on the surface of a field to be ploughed, after a furrow is made, a person with a fork or rake goes before the plough, and throws from the surface, into the furrow, the manure upon as much soil as the plough is likely to turn over, which is thus effectually covered, and prevented from being exposed to the atmosphere. This should be done *in all cases*, and not restricted to the potatoe crop, as in this country.

The Baron de Serret has ascertained, that powdered rape cake, strewed over the surface of the ground, destroys la taupe grillon (*gryllo talpa*), so injurious to kitchen gardens, and he is persuaded that every insect of the same species may be destroyed by the same means*.

But the great improvement that has taken place, in regard

* The use of oil in vegetation also, is very great. When the cuttings of gooseberries are planted, it should be done in a lump of clay mixed with cow-dung,

to manure, is, its being applied in a liquid state. For that purpose, the urine of cattle and horses is regularly collected into cisterns, that none of it may be lost. Mr. Mondez has five cisterns at Frasnès, fit to contain 230 metres (about 250 English yards in capacity), for receiving the urine of 68 cattle, of different ages, and 32 horses, young and old. This quantity of urine manures 16 French hectares, or about 40 English acres. Many other farmers adopt the same system.

It is proper to state, that several intelligent practical farmers object to this plan, alleging, that the dung of the farm-yard loses as much as is gained by the cistern system. But those who were appointed to examine Mr. Mondez's practice declare, that owing to the judicious concavity of the farm-yard, there was as much moisture as was necessary to ferment the straw, which may be effected by water alone, and repeated turnings, as gardeners know well; and it is now ascertained, by the experience of the Swiss, that liquid manure is the most efficacious of any, and produces a third more effect than what is spread on the surface. Hence, after the dung is fermented, they dilute it in water, and the liquid alone is carried to the field, and scattered over it. The earth immediately imbibes the liquid, which soon reaches the roots of the plants, and causes a rapid vegetation; whereas it is a long time before dung in a solid state fertilizes the soil. The straw that remains after the dung is thus washed, is applied as manure for potatoes.

and a few drops of train oil; and when young thorns are planted in a poor or sandy soil, they will thrive better, if their roots are dipped in oil. Near the first turnpike going to Milend, there is an artificial manure sold, supposed to be the sweepings of the dry-salters in Thames-street, mixed with the refuse of those places where the blubber of whales is boiled, one bushel of which, it is said, is equal to twenty-eight of common manure.

The experience of Mr. Harley, who keeps a great dairy near Glasgow, corroborates this doctrine. He says, "That the advantages of irrigating grass lands with cows' urine, almost exceeds belief. Last season some small fields were cut six times, averaging fifteen inches in length at each cutting, and the sward very thick. The soap-suds of a neighbouring wash-house are applied to the same purpose, with considerable advantage."

The great argument for separating the urine from the dung is, that it is always at the command of the farmer, and can be applied in any manner he thinks most advantageous. It is peculiarly useful in spring, when the application of liquid manure gives a new fillip to the plant, and makes its growth more vigorous. The urine is much improved by powdered rape-cakes, which are frequently thrown into the cisterns.

XI.

On Double Crops in the same Year.

It is astonishing what exertions are made, to raise the food necessary to maintain the great number of cattle and horses, which are required to furnish the quantity of dung and urine, without which a farm could not be properly cultivated according to the Flemish system*. Among the means adopted for that purpose, the raising of double crops, on the same ground, and in the same year, is certainly the most effectual.

In some parts of England, after the crops of grain are harvested, the land is ploughed, and turnips sown, but it is far from being a general practice; whereas, in the Pays de Waes, it is stated to me on the most respectable authority, that two crops in the same year, are not only advantageous, but absolutely necessary; for without them, a farmer could not maintain his cattle during the winter season, and would lose all the benefit he derives from the dung of the stock, and of his milch-cows. The following are the second crops raised in Flanders: 1. Carrots; 2. Turnips; 3. Spurry; 4. Yellow-clover.

1. *Carrots*.—With a crop of winter-wheat, sown broadcast, they often sow carrots in spring, and if they perceive, when the wheat is gathered, that the carrots are not abundant, they scatter some turnip-seed where it is necessary. They

* See Description of a Farm of 28 hectares and 34 ares, about 70 English acres, by Mr. Vanderfosse: *Proces Verbal de la Societ d'Agriculture du Department de la Lys*, an. 1808, p. 58.

also sometimes sow carrots in their flax, or in their barley or rye, in February. In fact, in the Pays de Waes, they hardly ever fail to sow carrots with their crops of wheat, rye, and barley, in February, and with their flax in April. It is a great advantage, that they are thus induced in the autumn, to weed the land once more, and to pull up even the roots of the grain, to increase their manure.

Where the land is drilled, this system of double cropping with carrots might be advantageously adopted. The carrots are given to horses, and great quantities of young horses are reared, by this system, at a moderate expence.

2. *Turnips*.—Turnips are sown after the crop is reaped, the land being slightly ploughed for that purpose. The turnips never grow large, but they are of great use to milch cows, and it is remarked, that they never give any taste to the milk or butter. They are suffered to shoot, and the cattle greedily devour them in that state, till the middle of April. This is the way in which turnips are usually raised in the Netherlands, and it is found extremely advantageous. Instead of turnips, rape is sometimes transplanted from beds prepared for that purpose.

3. *Spurry*.—After the crops of corn have been reaped, the ground is lightly ploughed, in some parts of Flanders, and sown with spurry. The cows are tethered on it in October, and a space allowed to each, proportioned to the quantity of food that is necessary for her. The butter from the milk thus obtained, is called spergule butter, and it is employed for the use of the kitchen, as being both cheaper and more profitable than any other for that purpose.*

* See Communications to the Board of Agriculture, Vol. I. p. 226.

4. *Yellow Clover*.—In the neighbourhood of Sombreffe, they sow, at the same time with their oats, the seed of trefoil, or yellow clover, and get one good cutting of that crop before it is necessary to plough the land.

Where winter barley is cut to be consumed green in the spring, it is usual in the neighbourhood of Lisle, to raise in the same year, cabbage, carrots, beet and potatoes, after three ploughings, and manuring the land with urine.

It is by attending to these minutiae, that the Flemish farmers amass so much manure, and extract so much produce from soils, originally light and sterile, and which would soon revert to their former state of barrenness, without the greatest industry, and most unwearied attention.

XII.

On the Improvement of Waste Lands in Flanders.

THE old mode of improving waste lands in Flanders was slow, but efficacious. The Religious Houses, by whom such improvements were principally effected, never undertook more than from five to six bonniers, or from fifteen to eighteen English acres, in one year; but then as much manure was collected, as completely to alter the nature of the soil, and to produce such crops, as furnished dung sufficient for future culture, under a judicious system of rotation*.

The greatest exertions to improve wastes for arable culture, on the Continent, are those near Breda and Bois le Duc, the particulars of which I am in hopes of receiving: but many Proprietors consider the best mode of improving a dry and sandy soil, is by *planting*, according to the following system:

Where that soil prevails, it is usually covered with heath, and other useless plants. These are burnt as a preparation for sowing the seed of the Scotch fir, the larch, &c. At the end of three years the young trees cover the surface; they are afterwards gradually thinned as necessary, during their growth, and at the end of from thirty to thirty-five years, an arable soil is formed, from the decayed leaves, of four or five inches thick. The wood is then cut down, and the same process is repeated. At the end of the second period of from thirty to thirty-five years, the soil becomes above a foot in depth, and it may then be cultivated for all the various crops raised in the neigh-

* Communications to the Board of Agriculture, Vol. I. p. 225.

bourhood, in perpetual rotation. As young trees produce the greatest quantity of leaves, hence it is necessary to have the ground twice planted.

It is evident, that where the soil is not naturally fertile, and materials to render it so cannot be obtained, there are but two modes by which it can be improved, either by grass or planting. By converting waste lands into sheep pasture, the soil is necessarily enriched, but it is only rendered capable of occasional cultivation. Whereas if the improvement is carried on by means of plantations, under the system above detailed, a soil is in process of time created, which may, under judicious rotations, be kept in perpetual culture. This is certainly a slow mode of proceeding, but a sure one; and if it does not suit private individuals, yet it might be a proper object for the attention of a great corporation, to whom immediate profit would be of less importance. All the expence attending this creation of a new soil, is, at the same time, amply repaid by the profits of the plantation.

XIII.

On the use of Broad Wheels, and the state of the Roads in Flanders.

To a person who had so anxiously endeavoured to introduce the use of cylindrical broad wheels into this country, it was highly gratifying to find, not only that broad wheels were established in Flanders, *by law*, but to be assured, that the people, who were extremely unwilling to adopt them at first, were so much convinced of their superiority, and of the advantages resulting from them, that they would not now give up the use of them if they were permitted. These broad wheels are called "*Malbrouks*," from the famous Duke of Marlborough. An old priest informed me, that he had seen some ancient engravings, in which they were distinguished by that name, and it is supposed that they were first introduced into Flanders by that celebrated warrior.

The use of broad cylindrical wheels was first established by law, in Flanders as well as France, in the time of the Republic. There is a collection of laws printed regarding that subject*, in which the reasons for enforcing the new system are detailed. The roads seem then to have been in a most deplorable state, even the pavements were so much damaged, and so full of holes, that in many cases communication was impossible; and when the roads were repaired, the enormous weights of the waggons and stage-coaches, destroyed in an instant the labour of many weeks. It was stated, however, that if the wheels

* Manuel des Entrepreneurs, printed by Garnery at Paris, an. 1809. They have also a simple but ingenious mode, of fixing the hind wheels of waggons when going down hills.

of those vast machines were constructed of broader dimensions, and if the weight, at present resting on a small space, were placed on a large one, the same damage would not be sustained. It was declared, that the interests of individuals should no longer be paramount to that of the public, that the weight of all sorts of carriages should be regulated according to the form of the wheels, and that during those seasons when the pavements are most likely to be injured, owing to the nature of the soil on which they were formed, the passing upon them should be suspended, and the side roads alone should be used. In order to be enabled to enforce this law, weighing-engines were ordered to be erected, and the owners of carriages exceeding the legal weights, were liable to severe fines.

The whole system of conveyance in Flanders, merits attention. I found all the great roads paved in the centre; a plan which ought to be followed in this country, wherever proper stones can be had, for the expence is nothing, compared to the advantages resulting from it. Along the sides of the roads, there was in general a row of lofty beech, the branches of which were cut nearly to the summit, by means of long poles, with a kind of chisel at the end. These trees are not so injurious to the roads as our thick hedges and branchy timber, whilst the high trees afford a shelter to the adjoining field from the heat of the sun, which is reckoned extremely advantageous where the soil is sandy. The roads are kept in repair by moderate tolls, and weighing engines are occasionally erected for their protection against exorbitant weights.

XIV.

Miscellaneous Observations.

1. *Course of Crops.*—The most approved course of crops in the celebrated Pays de Waes, is as follows :

1. After the land is trenched, and well manured, potatoes are planted the first year.
2. Wheat, with manure, sown in October or November; and carrots in February, for a second crop, the same year.
3. Flax, manured, and likewise sown with clover seed for the next crop.
4. Clover.
5. Rye, or wheat, with carrots for a second crop.
6. Oats.
7. Buck-wheat; after which the ground is retrenched.

2. *Seasons of Sowing and Reaping.*—In the Pays de Waes, the seasons for sowing and reaping, are as follow :

Crop.	When sown.	When reaped.
Wheat,	October or November.	End of July or beginning of August.
Rye,	October, November, December.	} July.
Winter barley,	October.	
Oats,	March and April.	End of August.

In many parts of Flanders, however, particularly where the land is strong, the harvest is later.

3. *Produce of the several Crops.*—In the Pays de Waes, the usual produce of wheat is twelve for one, and upwards. It is never less than from six to seven for one, a clear proof that no destructive malady prevails in that district. Upon enquiring into the reasons of the deficiency complained of, I was informed, that it was occasioned by bad weather, sometimes in the season of sowing, and sometimes in that of reaping. In seed time, more especially, the winds are often very high, and there is either too much drought, or too much rain. The harvests also are much injured by wet weather, and even violent tempests.

The produce of the several crops in the neighbourhood of Bruges, is estimated as follows ;

Winter wheat,	11 for one.
Spring wheat,	8 for one.
Winter barley,	19 for one.
Spring barley,	16 for one.
White oats,	40 for one.
Rye,	16 for one.
Buck-wheat,	40 for one.
Small beans, broad-cast,	5 for one.

But when beans are cultivated in rows, the produce is much more considerable.

4. *Sheep-Feeding.*—It is a rule almost universally adopted in Flanders, to give sheep dry food, as rye sheaves, bean sheaves, &c. ; and the flesh of sheep thus fattened, is reckoned peculiarly excellent. I saw but one exception to this general rule, where the wash of a distillery was given them, which they took with great avidity.

5. *Cures for the Foot-Rot.*—Several receipts were given me against that disorder. The following was

strongly recommended by the shepherd of the Count de Rosenberg, near the Hague. Gold leaf three ounces, verdigrise six ounces, vitriol three ounces, burnt alum three ounces; the whole should be reduced to fine powder, and then boiled with a pound and a half of ordinary honey; after stirring it frequently, it is allowed to become cold. When the malady is slight, once anointing the foot will be sufficient, but it must be done every day, if the disease has lasted long. Ever since the use of this remedy, the Count de Rosenberg's Merino sheep have never experienced any injury from the foot-rot. In Sweden, it is said, that tar and oil, and powdered charcoal, will prevent and cure it*.

6. *Poultry*.—Great numbers of fowls are kept in Flanders, but they are not reckoned profitable to the farmer, if he is obliged to give them grain beyond what they pick up in the farm-yard, except when they are put up. In some parts of Flanders, great pains are taken to fatten them for the table. They are fed with the flour of buckwheat, or rye, or with potatoes; their food is often changed, and the vessel into which their meat is put, is washed with hot water after every repast. After feeding, they are kept in darkness till their next meal.

7. *Draining*.—In the Duchy of Limburg, they have covered drains in the furrows of strong land, which they find an excellent mode of rendering it more accessible to culture at all times. A similar plan has been adopted by an intelligent farmer in Scotland†.

* The following receipt was given me, as a remedy to prevent the sheep from being teased by flies, or injured by the scab or vermin, after being shorn: mix powdered brimstone with lard, or any kind of fat, and after it is thoroughly incorporated on the palms of the hand, stroke the skin of the animal with it.

† Husbandry of Scotland, second edition, Vol. I. p. 54.

8. *Size of Fields.*—In the Pays de Waes, the fields are in general very small, from two to three English acres, each separated by a ditch, the contents of which are spread over the middle, which is thus considerably elevated. This gives the water a tendency to flow into the ditches, on the sides of which trees are planted, and hedges are likewise reared, which are cut down every seven years. It has a singular appearance, to see a whole district covered, as it were, by small, but regular elevations.

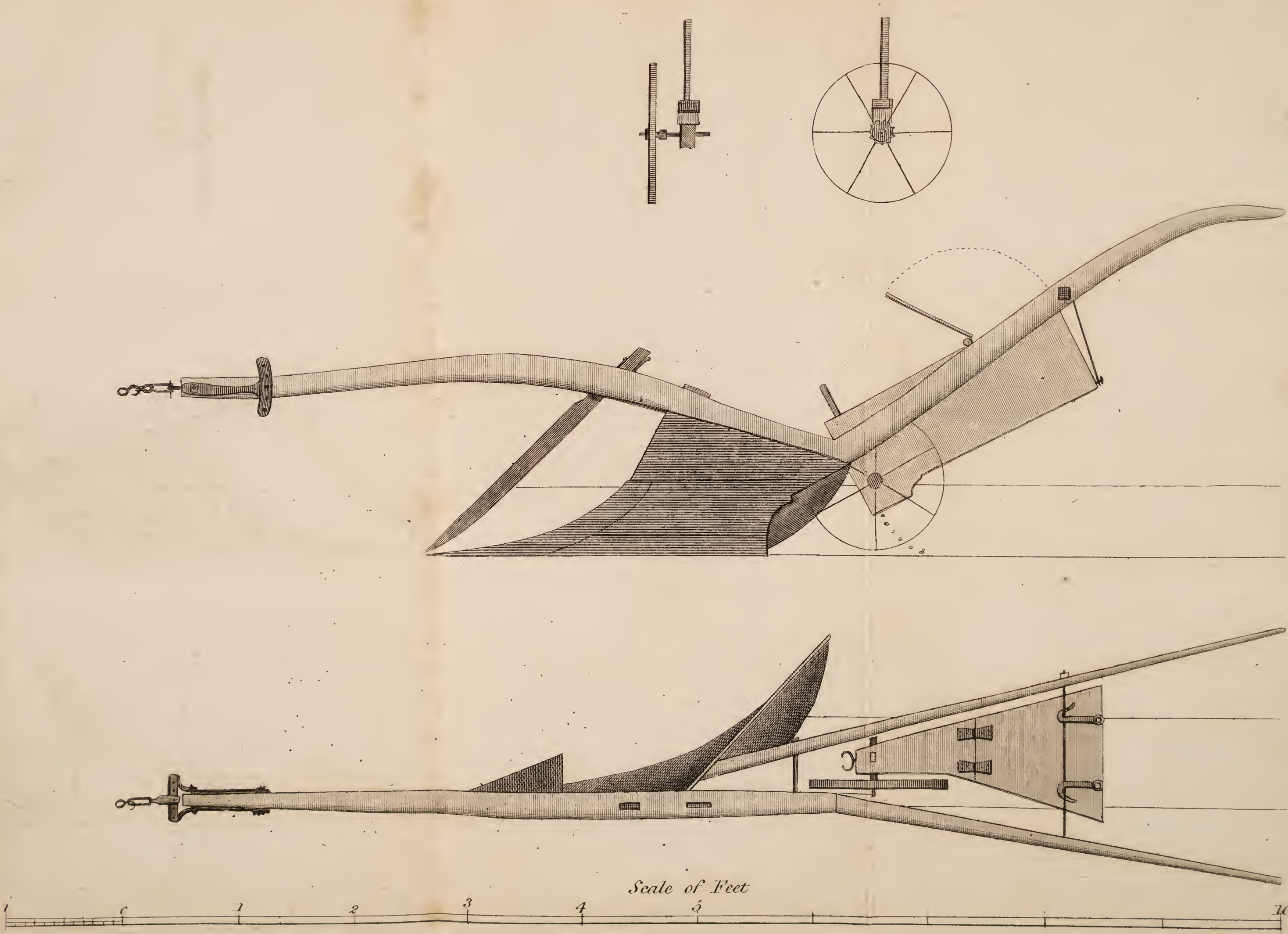
9. *Leases.*—It is found a great detriment to farming in Flanders, that the Leases are of short duration. In general, only from six to nine years, seldom twelve, and much more rarely for fourteen years.

XV.

On the Improvements which might be adopted from Great Britain by the Flemish Farmers.

It must not be supposed, however, that husbandry has been carried to such perfection in Flanders, that the Flemish farmers have nothing to learn. On the contrary, there are many useful hints, which they might derive from their brethren in Great Britain, some of which I propose shortly to state.

1. *Drill Machine*.—Their favourite object, the extirpation of weeds, might be greatly facilitated by the adoption of the drill husbandry for grain. The drill machines usually recommended, are, in general, complicated and expensive; but a machine that would answer the same purpose, has lately been invented by Messrs. Small, near Edinburgh, which is cheap, and certain in its operation. Its nature will be seen from the annexed Engraving, which is at the rate of three fourths of an inch to the foot. Its simplicity gives it a preference over all the other drills that have been hitherto constructed. It deposits the seed in so regular a manner, that there can be no blanks in the crop, and it saves a considerable expence, as the seed is sown at the same time by the plough, that the land is getting the last ploughing, or seed-furrow. The distance between the rows of the grain, when sown in this manner, is ten inches, and the depth at which it is laid, from four to five inches. That depth is a complete security to prevent the roots being thrown out of the ground, which frequently takes place in winter, upon light soils. This plan is admirably calculated for



the double crops raised, according to the Flemish system, as the crop might be sown in the intervals, after the first weeding; also for sowing clover on winter wheat, as the soil for the clover seed might be weeded and pulverised.

Mr. Dickson of Bangholm, near Leith, in Scotland, tried this plan with two acres of barley and oats, and it produced one-third more in quantity per acre, and the grain was of superior quality, to what he had sown at the same time by the hand, though in every respect, except in the sowing in drills, under the same management. Being fully convinced of the superiority of that system, he sowed, in the months of October and November last, about 27 acres of wheat, by that machine. The price is 2*l*. Small's light plough, the most beautiful instrument of the sort, and which costs only 3*l*. 10*s*. would be well calculated for giving the seed-furrow with this box.

Even this plan has been improved upon, by having the drill-box fixed to a small machine, to be dragged by a boy, who carries it along the furrow. When the box must be replenished with seed, a boy is only stopped, whereas, when a plough is used, a man and two horses are prevented from working. The drill-box also is so constructed, that it can be stopped at pleasure from delivering the seed*.

2. *Threshing-Mill*.—The farmers in Flanders knew so little of the improvements which have been made in other countries, that a machine for threshing grain seemed to them impossible. I have sent them, however, a model, which will satisfy them of the practicability of attaining that object; and it would not be difficult to annex the threshing machinery to the wind-mills, with which their country abounds.

* This drill-box may be seen at Cooke and Fisher's Agricultural Repository, opposite to the Pantheon, London.

3. *The Grubber*.—The scarificator or grubber would be of great use on their large farms, for pulverising the soil, and cleaning it of weeds; and though a small farm could not afford the expence of so dear an implement, yet on large farms, it would be extremely valuable.

4. *Iron Pillars for Corn Stacks*.—Their corn stacks are built upon the ground, by which they sustain great losses. These stacks might be erected on brick foundations; (See Communications to the Board of Agriculture, Vol. I. p. 72), or on stone pillars; but cast-iron ones are greatly preferable, and the expence would be refunded in one year. In wet seasons also, what are called *bosses* in Scotland, or an opening with wooden spars, in the centre of the stack, would be of great use.

5. *Rye-Grass*.—A mixture of rye-grass (*lolium perenne*) with their clover, if their crops were cut early, and their rye-grass not suffered to go to seed, would be of use. Clover alone is too succulent; but unless the rye-grass is cut young, it exhausts the soil. There are two sorts of rye-grass. The first an annual, which is the most productive for one year. The second, a perennial, which ought to be cultivated where the field is to be continued for two years or more in grass. The proper quantity is from one half to two-thirds of a bushel of clean rye-grass seed, per English acre, or about one bushel and a half per hectare, with the usual quantity of clover.

6. *Sheep*.—The Flemish breed of sheep cannot be compared to that of England, either for wool or carcass; and as sending sheep from England is prohibited, a proper selection from their own stock ought to be set about, or the Merinos more extensively reared.

7. *Hogs*.—Their breed of hogs is of a very inferior sort. They are long and narrow, instead of being short and compact. There is no obstacle to the exportation of

swine from England, and an advantageous change, by introducing pigs from the opposite counties of Essex or Suffolk, might soon be effected.

8. *Cattle*.—Their cows produce considerable quantities of milk ; but their shape might be greatly improved, so as to be fattened at much less expence. By the importation of a few good bulls of the best Devon stock, that object would be obtained.

9. *Lime*.—They have lime in abundance, but they do not use it in sufficient quantities. At Ostend, they ought to import it from Sunderland, *in shells*, (or burnt, but unslacked lime), whence it might be conveyed by the canals into the interior.

10. *Salt as a Manure for Flax*.—Mr. Lee, of Old-Ford, near Bow, Middlesex, has ascertained the advantages of strewing salt on the surface of the ground where flax has been sown. The quantity of salt should be the same as that of the seed sown, or about three bushels per English acre. It improves greatly the quantity and the quality of the flax, and in particular the quantity of the seed from the new crop. This must be of great importance in a country like Flanders, where the culture of flax is so general, and merits so much the attention paid to it.

11. *Swedish Turnip*.—One of the most important objects for the Flemish farmers, is, to cultivate the Swedish turnip for seed, instead of rape or cole-seed, the crop of which is precarious, whereas the Swedish turnip hardly ever fails, however severe the winter. The Swedish turnip may be transplanted, as well as rape, yields as much seed, and is equally valuable for producing oil.

12. *Potatoes*.—The potatoes in Flanders are greatly inferior to those in England ; and it would be of infinite advantage to the Flemish farmers, to procure from Great Britain or Ireland, seeds of the most improved varieties.

13. *Drilled Turnips*.—The turnips raised in Flanders, are, in general, second or after crops, and the beautiful and productive system of raising turnips *in drills*, so common on the borders of England and Scotland, and in other parts of the United Kingdom, is unknown. What a treasure it will be to Flanders, when that practice is introduced there !

14. *Improved Rotations*.—According to the system of the Flemish farmers, it is not unusual to have a spring crop of corn, after a winter one; for instance, spring rye after winter wheat or winter barley ; and after potatoes, they recommend two crops of rye, urging, that the second crop will be found the best. This practice is so contrary to all ideas of improved husbandry, (a fundamental maxim of which is, never to have two crops of white corn in succession), that it cannot be too speedily abandoned.

15. *Pastures*.—The Flemish farmers, with whom I either met or corresponded, do not seem to be at all aware of the great importance of retaining land in grass, as a means of improving the fertility of the soil; and hence they keep but a small number of sheep, compared to other stock. In the Department of the Dyle, which contains within its precincts, Brussels, Louvaine, Nivelles, &c. the stock maintained are as follow :

Cattle,	97,798
Sheep,	49,669
Horses,	30,642

A greater proportion of sheep, and land laid down to feed them, would, in various respects, be highly advantageous.

Other particulars occurred in the course of the survey I took of Flemish husbandry, but these are the most material.

CONCLUSION.

THE task is thus completed, which the interest the Author has taken for so many years in the agricultural concerns of the country, induced him to undertake. It seemed to him of peculiar importance, at the present crisis, to discover the causes which enable the Flemish farmers to raise corn so much cheaper than the British ; and to ascertain whether it was not in our power, to put an end to that *extraordinary difference* between the prices of the two countries, which exists at present, or at any rate, to bring it to somewhat nearer its former standard. That this may be accomplished, there is every reason to hope will be the case, provided proper attention is paid to the various particulars enumerated in the preceding pages, and more especially to the following : To a change of seed from the Continent,—the importation of Dutch ashes for our clover, and other crops ;—the use of salt for agricultural purposes ;—a diminution of fallows ;—more attention to weeding and to manures ;—a more general culture of flax and rape ;—and, above all, to the means by which the diseases of wheat, and the mildew in particular, can be most effectually prevented.

JOHN SINCLAIR.

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APPENDIX, No. I.

Average Prices of Wheat, Barley, and Oats, in England, from the Year 1771, inclusive, to the Year 1815. From Catherwood's Tables. Drawn up by Arthur Young, Esq. Secretary to the Board of Agriculture.

Year.	Wheat, per quarter.			Barley, per quarter.			Oats, per quarter.			
	L.	s.	d.	L.	s.	d.	L.	s.	d.	
1771	—	2	7	2	1	5	8	0	16	8
2	—	2	10	8	1	5	4	0	16	2
3	—	2	11	0	1	8	4	0	17	2
4	—	2	12	8	1	8	6	0	17	10
Average	2	10	4	1	6	9	0	16	11	
1775	—	2	8	4	1	6	0	0	16	6
6	—	1	18	2	1	0	2	0	15	0
7	—	2	5	6	1	0	6	0	15	8
8	—	2	2	0	1	2	8	0	15	2
9	—	1	13	8	0	19	6	0	14	0
Average	2	1	6	1	1	9	0	15	3	
1780	—	1	15	8	0	17	0	0	12	10
1	—	2	4	8	0	17	2	0	13	8
2	—	2	7	10	1	2	6	0	15	2
3	—	2	12	8	1	10	4	0	19	10
4	—	2	8	10	1	3	7	0	18	6
Average	2	5	11	1	2	1	0	16	0	
1785	—	2	11	0	1	3	4	0	16	11
6	—	1	18	10	1	4	0	0	17	10
7	—	2	1	2	1	2	4	0	16	8
8	—	2	5	0	1	1	2	0	15	9
9	—	2	11	2	1	2	6	0	15	10
Average	2	7	5	1	2	10	0	16	4	

Year.		Wheat, per quarter.			Barley, per quarter.			Oats, per quarter.		
		<i>L.</i>	<i>s.</i>	<i>d.</i>	<i>L.</i>	<i>s.</i>	<i>d.</i>	<i>L.</i>	<i>s.</i>	<i>d.</i>
1790	—	2	13	2	1	4	10	0	18	11
1	—	2	7	0	1	5	4	0	18	0
2	—	2	2	11	1	6	4	0	17	5
3	—	2	8	11	1	11	4	1	0	5
4	—	2	11	8	1	12	4	1	1	6
Average		2	8	8	1	8	0	0	19	0
1795	—	3	14	2	1	12	8	1	4	3
6	—	3	17	1	1	15	0	1	1	10
7	—	2	13	1	1	7	6	0	16	4
8	—	2	10	3	1	8	6	0	19	6
9	—	3	7	6	1	15	0	1	7	2
Average		3	4	5	1	11	8	1	1	9
1800	—	5	13	7	2	19	7	1	19	7
1	—	5	18	3	3	6	11	1	16	0
2	—	3	7	5	1	13	2	1	0	6
3	—	2	16	6	1	4	10	1	1	2
4	—	3	0	1	1	10	4	1	3	4
Average		4	3	2	2	2	5	1	8	1
1805	—	4	7	10	2	4	9	1	10	8
6	—	3	19	0	1	18	6	1	7	4
7	—	3	13	3	1	18	5	1	8	2
8	—	3	19	0	1	19	0	1	15	3
9	—	4	15	7	2	7	3	1	12	10
Average		4	2	11	2	1	7	1	10	10
1810	—	5	4	5	2	8	5	1	9	8
1	—	4	14	8	2	2	0	1	8	0
2	—	6	5	6	3	6	1	2	4	0
3	—	5	8	9	2	18	4	1	19	3
4	—	3	13	10	1	17	3	1	6	5
Average		5	1	5	2	10	5	1	13	5

Average Prices of Wheat, Barley, Oats, and Rye, in Flanders, from the Year 1771, inclusive, to the Year 1805, without reference to the difference of Exchange.

Year.	Wheat, per quarter.			Barley, per quarter.			Oats, per quarter.			Rye, per quarter.		
	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.
1771 —	1	13	7	1	4	0	0	12	10	1	6	4
2 —	1	13	1	1	1	9	0	13	1	1	1	10
3 —	1	9	11	0	17	2	0	10	3	0	16	4
4 —	1	12	8	0	19	6	0	9	10	1	4	0
Average	1	12	1	1	0	7	0	11	6	1	2	1
1775 —	1	8	1	0	16	9	0	11	6	0	19	11
6 —	1	5	10	0	14	6	0	9	10	0	16	4
7 —	1	8	1	0	15	5	0	10	3	0	15	5
8 —	1	8	7	0	14	6	0	10	3	0	17	8
9 —	1	6	9	0	13	7	0	10	3	0	15	11
Average	1	7	5	0	14	11	0	10	5	0	17	0
1780 —	1	10	4	0	17	8	0	12	5	1	4	0
1 —	1	8	7	0	16	2	0	11	1	0	18	7
2 —	1	8	1	1	0	10	0	15	0	0	19	0
3 —	1	15	10	1	5	4	0	11	1	1	4	11
4 —	1	10	4	1	0	5	0	11	6	1	0	10
Average	1	10	7	1	0	1	0	12	5	1	1	5
1785 —	1	11	3	1	0	4	0	16	3	1	0	10
6 —	1	13	1	1	1	8	0	16	3	1	1	8
7 —	1	13	1	1	2	2	0	11	6	1	1	8
8 —	1	15	10	1	3	11	0	11	11	1	4	5
9 —	1	9	5	1	2	3	0	11	1	1	4	5
Average	1	12	6	1	2	0	0	13	4	1	2	7
1790 —	1	10	5	0	16	9	0	11	11	0	18	7
1 —	1	9	11	1	2	2	0	12	4	0	17	8
2 —	1	18	11	1	3	1	0	13	8	1	3	11
3 —	2	3	6	1	5	4	1	1	4	1	13	1
4 —	2	3	6	1	5	4	1	1	4	1	13	1
Average	1	16	7	1	2	6	0	16	1	1	5	3

Year.		Wheat, per quarter.			Barley, per quarter.			Oats, per quarter.			Rye, per quarter.		
		L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.
1795	—	3	16	2	2	2	1	0	18	0	2	12	7
6	—	1	14	0	1	3	7	0	13	3	0	17	3
7	—	1	9	11	0	18	7	0	11	11	1	0	4
8	—	1	10	5	0	19	5	0	15	5	0	19	11
9	—	1	19	10	1	0	9	0	13	8	1	5	4
Average		2	2	0	1	4	10	0	14	5	1	7	1
1800	—	2	4	5	0	19	0	0	11	11	1	7	9
1	—	2	18	5	1	9	5	1	0	1	1	18	11
2	—	2	13	11	1	8	6	1	1	4	1	18	1
3	—	1	18	1	1	6	3	0	15	10	1	5	4
4	—	2	11	1	1	11	2	0	18	6	1	10	4
Average		2	9	2	1	6	10	0	17	4	1	12	1
1805	—	3	17	7	1	2	11	0	18	4	1	12	0
6	—	2	1	1	0	19	10	0	12	8	1	0	10
7	—	2	9	0	1	4	4	0	16	3	1	5	10
8	—	2	2	0	1	6	3	0	16	7	1	7	8
9	—	2	3	5	1	5	11	0	15	0	1	6	7
Average		2	10	7	1	3	10	0	15	9	1	6	9
1810	—	2	11	1	1	4	9	0	15	2	1	7	1
1	—	3	17	11	1	12	1	0	15	10	2	5	2
2	—	3	5	7	2	1	6	1	0	0	1	15	11
3	—	2	7	5	1	3	1	0	14	11	1	8	8
4	—	2	8	1	0	19	11	0	15	10	1	10	5
Average		2	18	0	1	8	3	0	16	4	1	13	5

APPENDIX, No. II.

On Farm Buildings in Flanders, with an Explanation of the annexed Engraving.

THE Committee appointed to examine the farm buildings of Mr. Mondez, reported, that they were built with great solidity, and with a proper attention to salubrity, being vaulted and well aired. The granaries were excellent, and the barns spacious, being 48 metres in length, 16 in width, and $7\frac{1}{2}$ in height, which is about 124 feet in length, 32 feet in breadth, and 20 feet in height. Indeed the size of the barns in the Walloon country, exceed even those in England, and occasion a great expence, perfectly unnecessary since the invention of threshing mills, and the improved modes of stacking corn on iron pillars.

The annexed plan will be sufficiently understood by the subjoined explanation of the numbers referred to.

1. The vestibule, or entrance.
2. The salle, or hall.
3. 4. and 5. Closets.
6. Sheds destined for different purposes, but more especially for elevating or letting down grain from the granaries by machinery.
7. Kitchen.
8. Washing house.
9. Chamber for female servants.
10. Hall.
- 11 and 12. Closets.
13. Necessaries.
14. Room for the gardener.
15. Shed for fuel.
16. Kitchen garden.
17. Hoggery.
18. Poultry yard.
- 19 and 20. Stables for cows and calves.
21. Necessaries for the servants, connected with the cisterns.

- 22. and 23. Sheep folds.
- 24. and 25. Shed for carts.
- 26. Barn for the flax.
- 27. Area.
- 28. Flax barn.
- 29. and 30. Sheep houses.
- 31. and 32. Stables for the horses and foals.
- 33. 34. 35. 36. Places for the hogs.
- 37. and 38. Cisterns destined to receive the urine of the cattle.
- 39. Wells.
- 40. Dung pit, concave in the middle.
- 41. Pool serving to receive the superabundant waters of the dung pit, the weedings of the gardens, &c.
- 42. Reservoirs to receive the waters in the farm yard.
- 43. Ports of entry, with dove cotes, of which the two most convenient ought to be pitched upon, and the rest shut up.
- 44. Small trenches or ditches.
- 45. Sheds destined for clover, cut green in summer, or dry in winter.
- 46. Cistern for the wash-house.
- 47. Situation of the corn stacks in years of abundance.

Fig. 1. Elevation of the right wing of the buildings. from A. to B.

Fig. 2. Elevation of the left wing of the buildings, from C. to D.

Fig. 3. Elevation of the house, &c. from E. to F.

Fig. 4. Elevation of the barns.

Mr. Mondez's farm buildings at Frarnes, are nearly on the same construction. The plan above detailed was drawn up by him, with the assistance of several other intelligent farmers.*

* I observed in the Walloon country, a particular mode of making floors, by small brick arches, from one beam to the other, instead of using deals; then making the floor with bricks. It saves timber and prevents fires, and is excellent for granaries; but requires strong walls.

APPENDIX, No. III.

Abstract of the Expences necessary to commence the cultivation of a farm of 100 French hectares, or 250 English acres, in the plain of Fleurus.

I. <i>Live Stock.</i>		French francs.	English money, £. s. d.		
15	Work horses at 400 fr. or 16l. 13s. 4d. each	6000	250	0	0
10	Young horses, of different ages, at 230 fr. or 9l. 10s. each	2300	95	16	0
1	Riding horse	400	16	13	4
14	Milch cows, at 216 fr. or 9l. each	3024	126	0	0
16	Young cattle of different ages, at 80 fr. or 3l. 6s. 8d. each	1280	53	6	8
180	Sheep for fattening, at 20 fr. or 17s. 8d. each	3600	150	0	0
	Swine of all sorts	500	20	16	8
	Poultry, as fowls, ducks, pigeons, &c.	100	4	3	4
		17,204	716	16	8
II. <i>Instruments of Husbandry.</i>					
1	Waggon (a la Malbrouck) with large fellys	1100	45	16	8
3	Lighter waggons at 450 fr. or 19l. 11s. 8d. each	1350	56	5	0
4	Ordinary ploughs, with wheels at 60 fr. or 2l. 10s. each.	240	10	0	0
1	Dutch foot plough	63	2	12	6
3	Binots with wheels, at 60 fr. or 2l. 10s. each	180	7	10	0
3	Rollers, of which there is one large, and one very light of wood, and the other of stone	80	3	6	8
8	Harrows, of different sorts, (all of wood) at 10 fr. or 8s. 4d. each	80	9	6	8
	Small articles	219	2	2	6
		3312	138	0	0

III. *Harness.*

	French francs.	English money. £. s. d.
16 Bridles, &c. at 28 fr. or 1l. 3s. 4d. each -	448	18 13 4
Various articles of horse furniture - - -	232	9 13 4
98 Iron chains for the cows, at one fr. or 10d. each - - - - -	28	1 3 4
	708	29 10 0

IV. *Furniture.*

The necessary furniture, consisting of ward-
robes, chairs, tables, beds, linen, all that con-
cerns the dairy, the necessary utensils for the
stables, &c. are valued at - - - -

5000 208 6 8

N. B. The custom established in the plain of
Fleurus, is, that a farm is entered on the first of
May, so that the land is cultivated for fifteen
months before any material advantage is derived
from the crop, by the incoming tenant.

V. *Servants Wages.*

Three servants to work the horses; one to
take care of the young horses; a shepherd,
two women, a swine herd. Their wages are
calculated, one with another, at 110 fr. or
4l. 11s. 8d. per annum, making in all - - -

880 36 13 4

And for the three surplus months - - -

220 9 3 4

For their maintenance, the produce of the
dairy, and the garden must go a considerable
length, but the flesh, the bread and the beer,
must be purchased. This may cost for each
head per day 35 centimes, or for 15 months -

1260 52 10 0

The maintenance of the farmer and his family,
their clothing, &c. it is calculated, may be de-
frayed by the sale of the milk, and other small
productions of the farm yard.

2360 98 6 8

VI. Maintenance of the Horses for fifteen months.

To maintain 15 horses from the first of May to the tenth of June (41 days) at 78 centimes per day, each horse, amounts in all

French francs.	English money. £. s. d.
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511	21 5 10
-----	---------

For ten young horses at 60 centimes per day, for 20 days, when they can be sent to pasture, will cost

120	5 0 0
-----	-------

This expence however might be saved, by only buying the young horses at the time when they can be fed on the pastures, or on cut clover.

The maintenance of 15 horses, and ten young horses, calculated at the rate of 27 cent. per day, for each head, for fourteen months, gives a total of

2948	122 16 8
------	----------

N. B. Although the price per day is estimated very low, the value of the cut clover, hay, corn and straw produced on the land for their sustenance, ought to be included. In the seed-time, during spring in particular, this expence must necessarily be considerable.

3579	149 2 6
------	---------

VII. Seed and Manure.

1. Clover seed for 13 hectares for one year, or 26 hectares, equal to 65 English acres, during the 15 months

334,62	13 18 10
--------	----------

2. Dutch ashes for 26 hectares, at the rate of 26 cuvelles to each hectare, at 1 fr. 8 cent. each cuvelle. Hence, for 26 hectares there must be

730,08	30 8 5
--------	--------

3. To lime

98	4 1 0
----	-------

4. To coal ashes to mix with the lime

22	0 18 4
----	--------

5. To seed for beans and other crops of that sort

1035,50	43 2 11
---------	---------

6. To seed for 24 hectares, or 60 English acres of spring corn

360	15 0 0
-----	--------

7. For plants for 8 hectares, or 20 English acres of coleseed

208	8 13 4
-----	--------

8. To seed for 8 hectares, or 20 English acres of flax

480	20 0 0
-----	--------

9. To weeding the flax

176	7 6 8
-----	-------

3414,20	143 10 2
---------	----------

VIII. <i>Number of days work to pay for during the fifteen months.</i>		French francs.	English money. £. s. d.
1. Five labourers, at the rate of 125 days each, or 625 days in all, at 73 cents per day -		456,28	19 0 3
2. Women and girls - - - - -		228,12	9 10 1
3. Weeding the crops the 2nd year by hand labour - - - - -		744	31 0 0
4. The farrier, wheel-wright, and harness- maker, for 15 months, will amount at least to - - - - -		400	16 13 4
		1828,00	76 3 8

The abstract of the whole, amounting to 37,476 francs, or 1561l. 10s. sterling, is given in the introductory observations, p. 9.

On the above detail the following Remarks occur :

I. The number of milch cows kept is a striking circumstance, and that species of stock is uniformly much attended to in Flanders, both for the produce of the dairy, and as a great source of manure.

II. The price of the several implements is certainly much lower in Flanders than in England, but in general they are greatly inferior in point of shape and utility. The ploughs, for instance, are miserable instruments, and their harrows are made of wood.

III. Their cattle are in general tied by iron chains, which are placed round their necks. They are light and strong, and preferred to any other.

IV. The servants wages and maintenance are higher in other parts of Flanders. The wages of a bailiff or overseer, is sometimes 15l. besides his maintenance; and of a farm servant from 7l. to 8l.

V. The produce of the milch cows must be considered of great value, when it is accounted equal to the whole expences of the farmer and his family.

VI. In other calculations the price of keeping a horse is estimated higher, exceeding 20l.

VII. It is singular, that the expence of the Dutch ashes, is more than double the price of the clover seed.

It is a common practice in Flanders, to mix lime with coal ashes; both are improved by it.

VIII. The wages of labourers are very low, not 8d. per day, for men; in some districts the wages are 10d. but no where do they reach 1s. per day. It is a striking circumstance to see 744 fr. or 31l. sterling, charged for *weeding* the crops of one year, independant of the flax crop, stated at 7l. 6s. 8d. additional.

APPENDIX, No. IV.

Conversion of French into English Weights and Measures.

The *Metre*, or the unit of space, is the 10,000,000th part of the quadrant of the meridian.

= 39,3828 inches, Log. 1,5953066, or = 1,094 Yards, Log. 0,0390041.

The *Litre*, or the unit of measure of capacity, is the cube of a tenth part of the metre.

= 61,0829 cubic inches, Log. 1,7859198, or

= 1,0577 wine quarts, Log. 0,0243678 = 2,8405 Winchester bushels, Log. 0,4533965.

The *Hectolitre*, or new French bushel, equal to 22,724 Winchester gallons, Log. 1,3564865.

The *Are*, or the unit of superficial measure, is a square, the side of which is = ten metres, or 32,819 feet, Log. 1,5161254

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= 3,956 perches, of 16,5 feet square, Log. 0,5972830.

The *Hectare*, or new French acre = 2,47265 statute acres, Log. 0,3931613.

The *Stere*, or the unit of a measure applicable to wood in a cubic metre

= 1,3092 cubic yards, Log. 0,1170123.

The *Gramme*, or the unit of weight, is the 1,000,000th part of a cubic metre, or the cube of the one hundredth part of a metre of pure water at the temp. of 40°. by Fahr. will be

= 15,4284 grains 1,1883278 about $\frac{5}{8}$ th of a drachm averdupois.

The *Killogramme*, or the new French pound,

= 2,204 pounds averdupois Log. 0,3432298.

A cubic foot of water at temp. 60 degrees of Fahr. weighs 62lbs. 5oz. 5,2dms. or 436339 grains.

A cubic inch therefore weighs 252,506 grains, Log. 2,4022717.

APPENDIX, No. V.

*Correspondence with the Public Offices, regarding the
Inquiries carried on in the Netherlands.*

UNDERSTANDING that I was likely to find, in the public offices at Brussels, the information collected by the French government, regarding the agricultural state of the Netherlands, I applied to the two public officers the most likely to furnish me with that information. I subjoin a translation of their answers, as a proof of their liberality in such cases, and of their politeness to an entire stranger.

Translation of a Letter from the Intendant of the Department of the Dyle.

THE Intendant of the Department of the Dyle, has the honour to present his compliments to Sir John Sinclair, and to inform him, that by coming in person next Saturday, at one o'clock, to the 12th division of his office, he may obtain all the information regarding agriculture, that can be procured for him there.

Tuesday, 11th April, 1815.

*Translation of a Letter from the Duke D'Ursell, Minister
of the Interior in the Netherlands.*

THE Commissary General of the Interior has the honour to inform Sir John Sinclair, that the correspondence of the Minister of France, with the Prefects, regarding Agriculture, has not been consigned to the Commissary of the Interior: but that, to gratify the wish of Sir John Sinclair, he has addressed a circular letter to the Superintendants of the Departments, to desire them to send all the documents in their possession on this subject; and

that, when they are received, Sir John Sinclair shall be apprized of it, and may have them communicated to him.

In the mean time, if he wishes it, he will be welcome to see the statistical information given by the Intendants, at the 4th section of the General Commissariat.

(Signed)

The Commissary General of the Interior,
The Duke D'URSELL.

Brussels, 15th April, 1815.

APPENDIX, No. VI.

Questions by Sir John Sinclair, regarding the Manufactures of Ghent; and Answers by Mr. Hye Schoutheer.

1. What was formerly the principal manufacture of Ghent? Was it not that of lace?

Answer. The manufactures of cloth, which, from this town, have been transplanted by emigration into England, from the middle to the end of the 16th century, formed, at that time, an inexhaustible source of riches and of prosperity, both to Ghent in particular, and to Flanders in general. Since that time, this manufacture has risen in Leige and Limbourg, to such a state of perfection, as to leave little to wish for. Spanish wool is employed in it, and we send, in exchange, our linen cloth, thread, and lace. We procure a considerable and advantageous market for these articles. There is but little competition against them.

The manufacture of lace, at the time the French entered the Low Countries, employed a considerable number

of women and girls, in a manner at that time general, by which the two sexes assisted in making lace, which contributed much to its perfection. Brussels, Malines, Ypres, Nivelles, &c. abounded equally in manufactures of lace. These two first towns excelled the others in richness of design, and in fineness of execution:—they made what was intended for courts and great occasions. At the epoch above-mentioned, the manufacture of lace was going on with great activity at Ghent.

2. Where did they sell them?

Answer. The lace made at Ghent was chiefly for daily use. It was sold in Holland, England, and France. In particular, a considerable quantity was sent to Spain and the Colonies. These last were of a quality and pattern quite particular; they were called *sorted laces*. There is much reason to fear that this lucrative branch of commerce will be entirely at an end, after an interruption of twenty years. The changes of fashion have even reached the West Indian colonists, whose favourite ornaments formerly consisted of these laces, and of Flemish fringes.

These laces were chiefly manufactured in the charitable establishments, or in the schools for poor girls, and by old women, whose eyes did not permit them to do finer work. As for the young girls, the facility of execution, and the quality of these Spanish laces, permitted the least skilful to work them with success, and proved a means of rendering them afterwards excellent workwomen.

At present, the best market for our laces, is in France: a few also are sent to England.

3. What is the principal manufacture at present?

Answer. Since the interruption of commerce with Spain, to which country Ghent furnished, besides lace, unbleached linen cloth, (the demand for which is beginning again,) and various other articles; we have been obliged to substitute a commerce in cotton, the raw material of which

is brought from England, to which there were many obstacles ; in particular, it is subject to high duties.

The *Mull Jennys*, that Monsieur L. Baurdens brought from England to Ghent, from whence they have spread in the country, have contributed to multiply the cotton manufacture of thread, and to improve the texture. They have become one of the principal branches of our commerce. They reckon twenty-one in Ghent.

4. Is the change a happy one with regard to wealth, security, and morals?

Answer. To the first part of this question it may be replied, that the manufacture of cotton and thread cloth at Ghent, in regard to the wages which it procures for the numbers employed, of all ages and of both sexes, has advantageously replaced the making of thread lace. Nevertheless, it remains to be proved, by experience, if these advantages will always be the same, or whether they are only the result of a concurrence of circumstances, almost unknown to the present generation ; for it was at the moment at which our lace-makers wanted bread, and that our cotton-printers were under the hard necessity of discharging a great proportion of their workmen, that the cotton manufactory above-mentioned took its rise. Our countrymen, yielding to necessity, took to it, as it required less knowledge and care, was quickly made, and procured them not only a livelihood, but an increase of wages. This last advantage was but temporary ; and few now quit the manufactories of thread lace, for those of cotton. Besides, they are convinced, that long use in weaving cotton, spoils the hand of the lace-maker ; so that were cotton cloths more generally made, it would infallibly destroy the perfection of our thread lace manufactory, and end by annihilating our commerce in that article.

As for the solidity of that kind of commerce, it would

be rash to decide about it yet; for although the first speculators have gained much, yet considering the immense buildings and machinery that these manufacturers have to erect, and the continued expence of keeping them up, it seems hazardous. The purchase of the raw material is but an object of secondary importance; and, unfortunately, experience has shown, by numbers who have failed, and others who are much straightened, that these vast establishments cannot be relied on, for furnishing a real and permanent benefit.

With regard to morals, we must deeply lament the disorders of which these establishments have been the source. The moral principle is there destroyed, and religion loses its empire. The unrestrained intercourse between the two sexes, at an age when the passions are in all their strength, is the cause of deplorable disorders. In short, the number of natural children has increased in an alarming manner of late years, and no other cause can be assigned but the one I have just mentioned; and which chiefly occasions the poverty which overwhelms that unfortunate class, whose wants seem to multiply with the increase of their wages.

The majority of the females employed are from twelve to twenty-five years of age. Their manners are extremely irregular, and most of them are burdened with children, whom their wages will scarcely maintain. Those who are discharged often perish in misery, or gain their bread in the most infamous manner.

The manufactory of thread lace was not subject to these unfortunate consequences, but seemed, on the contrary, to prevent them. These lace-makers were not assembled under one roof, but remained in their own families. The daughters, under the eyes of their mothers, preserved the purity of their morals, and formed no pernicious acquaintances; and frequent marriages gave citizens to the state

at whose birth their parents had no reason to blush. Poverty even was rare among this class, because their wants were moderate, and the product of the labour of the whole family was given to the parents, who generally employed it for the common benefit.

In fine, linen and thread lace offer us an advantage that we should hope for in vain from our cotton manufactories. In the former case, the raw material grows in our own country : from the sowing of the flax to the exportation of the merchandise, all is done by our own workmen ; nor are we tributary to any other country for any thing relating to it ; and whatever demand there might be for these articles, we had always enough of flax remaining, to carry on an extensive and advantageous commerce with France.

Ghent, 17th April, 1815.

APPENDIX, No. VII.

On the Management of a Meadow near Oudenarde, communicated by Monsieur Huyttens, of Termonde.

MONSIEUR de Contreras, at Oudenarde, has adopted a plan for managing a meadow, with so much success, that he is imitated by all his neighbours. His mode is simple, and its success depends on attention to the following rules:—

1. To level the surface of the meadow, by cutting little ditches, which, while they fill up the inequalities, draw off the waters after the inundations to which the meadow is exposed during the winter season.

2. To cover the meadow with earth, for about an inch in thickness, which causes new grass to spring up finer than that produced before, and not only better in quality, but longer, the soil being rendered more fertile. The soil may be further enriched, by spreading over it the contents of the ditches, and the slime which the waters have deposited in them. This process will likewise contribute to the salubrity of the meadow, which might otherwise become marshy; whereas, by clearing the ditches about the month of May, when the waters are dried up, this mud, spread over the meadow, enriches it much, and contributes greatly to an abundant crop. It is also customary, to raise that part of the meadow, which is next the waters, and to let them run off in one direction only, and by various turnings, which has the effect of preserving a greater quantity of slime.

3. To leave on the meadow, every second or third year, the second crop, which, in the following year, produces great abundance of grass of an extraordinary length.—It is not necessary, when this is done, to cover the mea-

dows with earth, as above mentioned, as it will be sufficiently enriched by leaving the second crop, and by clearing the ditches. This, however, could not be done every year. The growth thus excited, would be too much, and would finally ruin the soil.

4. To hinder the entrance of cattle into the meadow, as, by cropping up the plant, and trampling the grass under their feet, they greatly impede its growth.

5. Be careful to keep the meadow clean from weeds, especially before their seeds have spread.

Additional Information regarding this Meadow.

1. The meadow of which I have been describing the mode of cultivation, is near a river, and although all meadows might be cultivated in somewhat of the same manner, they cannot generally have the benefit of being inundated by a river.

2. I cannot exactly describe the composition of the earth laid over the meadow; but I suppose it to be well manured, and taken near the meadow which receives it.

3. The height of the above-mentioned meadow, was taken sloping; from a foot, to a foot and a half, was enough.

4. These meadows are mowed successively for crops of hay. Their produce is sold at from 50 to 70 florins per hectare, according to its quality, situation, and the abundance of the harvest for the year. This mode of culture, being too expensive for a temporary and often negligent tenant, is only regularly executed by proprietors, who take charge of their own farms, and who sell the grass upon the spot to the highest bidder.

ADDENDUM.

On the Diseases of Wheat.

AMONG the calamities attending the wars which succeeded the French Revolution, the impediments they opposed to the circulation and progress of useful knowledge and discoveries, has not been the least important. I found that the improvements we had made in agriculture and other useful arts, were but little known in Holland, or in the Netherlands. When I talked to the inhabitants in those countries, of threshing mills,—of steam boats,—of 100 tons of coals being conveyed on an iron railway by one steam engine,—of streets illuminated by gas,—of cloth being wove, and the finest cotton tamboured by machinery, &c. &c. they seemed extremely unwilling to give credit to the existence of such extraordinary circumstances. In the same manner, when I endeavour to explain to my countrymen, the discoveries made on the continent regarding the diseases of wheat, though they are sanctioned both by recent investigation, and by long experience, I find rather a disinclination to believe them. I think it necessary therefore, to lay before the reader, the very candid and satisfactory account of the means which have been discovered on the Continent, to prevent the diseases of grain, drawn up by M. Desmazieres of Lisle, which has been referred to in the preceding pages, but of which it seems to me desirable to give an entire translation. It will furnish hints, which may enable the intelligent farmers and philosophers of this country to prove, or to disprove, the doctrines therein laid down.

JOHN SINCLAIR.

On the principal Accidents and Diseases to which Wheat and the other Cereal Plants are liable, and the Means which may be employed to prevent them.

Translated from the "Agrostographie des Departemens du Nord de la France. Par J. B. H. J. Desmazieres," printed at Lisle, An. 1812.

WHEAT is subject to many accidents or diseases, which desolate the districts where it is propagated; they diminish, and sometimes totally destroy, the crop; and the unfortunate husbandman occasionally sees all his hopes blasted, and that in a very short period of time. Many enlightened naturalists have devoted their attention to ascertain the causes, that they may prevent these fatal effects. Among these, I ought particularly to mention M. Tillet, L'abbe Tessier, and M. Benedict Prevost, whose works have thrown the greatest light upon a subject so interesting both in regard to agriculture, and the physiology of vegetables. Notwithstanding the details, perhaps too long, into which I am forced to enter, I shall here report a part of the observations of these learned philanthropists, and the opinions of other naturalists, regarding the diseases of a plant, one of the greatest blessings which have been bestowed upon us by the Creator.

I ought to observe, that in treating of the diseases of wheat, I speak also of those of oats, barley, rye, Turkey wheat, &c.; so that in the chapters regarding these plants, I shall refer the reader to this.

I. *On the Smut.*

Smut (*la Carie*, also called *Bosse*, *Clogue*, *Chambucle*, *Bruine*, or *Brouine*) is one of the diseases of wheat, the

most generally to be met with, and whose ravages are the most considerable. It is not uncommon, in some countries, to see twice or three times as many smutted ears of corn, as sound ones.

The corn which is attacked by it, is of a brown or greyish colour : its envelope becomes parched and dry, and contains only a black delicate powder, with a strong disagreeable smell, particularly when it is fresh.

The smutted ears ripen sooner than the others : they are narrow, and may be known by a peculiar green colour. They do not rest upon their stem, like the sound ears ; they remain erect, and do not flower, although the staminæ are formed. — The plant of the smutted corn is generally lower, the top of the stem, immediately under the ear, is a little crooked, and its straw is less white than that of the rest. Smutted and sound ears are sometimes found on the same stem, sound and smutted grains on the same ear, and even the same grain may sometimes be only *partly* smutted.

Smut, therefore, attacks the interior of the grain, without changing the nature of the chaff, or of the other parts of the ear, which, however, it disfigures more or less, as well as the stem. When the rust is in the crop, it has been also remarked, that the smutted plants are most attacked by it.

Much has been written on the subject of smut ; but the country people consider many circumstances as the *causes* of it, which are in fact, only symptoms of its effects ; so that we shall not enter into any discussion on their opinions.

Messrs. Fourcroy and Vauquelin gave, in 1804, a chemical analysis of the smut, which has led them to conclude that this substance was a degeneracy of the gluten of the farina. M. Parmentier considers the perisperm as the part of the grain which is chiefly attacked, according to the results he

obtained, and which appeared rather to belong to the thick oils, than to farinaceous substances. But I do not think that by chemical analysis alone, however correctly made, the true cause of this disease can be discovered.

Adanson says, in comparing the powder of smut to that of *Vessesloup*, that on examining it in a microscope, he had been led to conjecture that it is owing to a vegetable, analogous to the plants of that class. M. Tessier was also persuaded that this disease could neither proceed from the soil, from the manures, nor from the moisture of the atmosphere. And M. Bernard de Jussieu, in his enquiries as to its primitive cause, has thought that smutted grains contained a kind of *Lycoperdon*, or *Reticularia*. His opinion has since been adopted by the generality of botanists.

As yet, however, no certain proofs had been obtained in confirmation of this conjecture ; all the *data* were uncertain, and the cause of smut continued problematical, until the ingenious observations made by M. Prevost.

In making experiments on the means of preventing the smut, this respectable naturalist also directed his attention to the direct cause of this scourge of the crops. By frequent experiments he ascertained, that the globules of the smut are organized bodies, or, to speak more correctly, the seeds, (*gemmes, gemmules, gongyles*) of a microscopic plant, and that this plant was the cause of the disease in the grain, After having placed these seeds in water, or in some very moist substances which might be favourable to their vegetation, he saw them produce small cylindrical stems of different sizes, often articulated, sometimes simple, and at others assuming at the extremity, the form of small stars ; the rays of which, though at first very short, became afterwards long, like straight, narrow leaves. Often also, this extremity spread itself into a thick mass, which appeared composed of small filaments interwoven with each

other, and, as it were, twisted like cotton. Two or three days after vegetation had commenced, he remarked upon the congregated stems, some small oblong pediculated bodies, which were the real fruit of the plant, and in which he sometimes thought he saw particles of an astonishing minuteness. The sprigs that shot out from the blown and conglomerated stems often grew to a considerable length ; they twisted together, and sometimes produced new ramifications. The fructiform productions, which were found upon the same stalks, often remained fixed together, after the latter had disengaged themselves ; and they changed their respective positions, like flowers or fruits, upon branches which continue to increase in growth. After some time the whole disappears, and there remain only some detached globules, which would probably have become seeds, similar to those from which they originated, if they had been in a convenient position ; that is in the embryo of the grain of some young blade of corn.

It has been proved, by the most ingenious observations, that the plant of the smut originates on that of wheat, or in its neighbourhood, and not within, by the introduction of seeds into the roots and vessels, as other authors have advanced ; that its stems, its shoots, or some other of its productions, penetrate into the plant of the wheat, whilst it is still very young ; that it reaches to the seat of the embryo of the grain, where it produces globules which increase with the ear, and become perfect seeds when the wheat approaches to maturity.

This plant, so small and delicate, would soon be destroyed by the winds, by rain, and by all the variations of the atmosphere, if wheat did not offer an asylum where it could propagate itself. Its seeds or gemmes grow there and unfold themselves, by the aid of dews, or of the moisture upon the wheat plant when it begins to appear, or on

the earth, before it has been produced. Then it is that the blades of tufts already blown introduce themselves upon the stem: the plant of the smut may perish, yet its branches continue to vegetate there.

I have said, that it is only at the moment of germination, or soon afterwards, that the plant of smut is introduced into that of wheat. In fact, if one rubs with smut the stems and the ears of wheat already advanced, either none, or very little smutted grain will be produced: but on the other hand, if the smut is spread over the soil either after, or a little while before the wheat is sown, there will be a great quantity. This fact is likewise proved by other experiments.

Thus it is now proved that smut is a plant destined to pass a part of its existence in wheat, and to nourish itself on the grain. It may be considered as an *intestine plant*, and may be compared in that respect to worms in the intestines of animals.

After what has been said of smut, one can easily conceive that this malady is contagious, as has been long remarked; and in order that it may take place, it is necessary that its seeds should be scattered upon the grain of wheat, or upon the young plant, or well mixed with the soil, in which it is grown. But this contact alone with smut will not suffice. To spread the infection in greater quantity, it is necessary that the seeds should be disseminated or separated, one from the other; and as they do not begin to vegetate unless the atmosphere has access to them, the contact of the air is absolutely necessary for their propagation. It has likewise been remarked that wheat, when very dry, if sprinkled with smut that is in a dry state, is not in general much smutted; on the other hand, if the wheat is in a moist state, and the smut very fresh, few of the plants escape the disease. These

facts coincide perfectly with the observations which have been made for a long time in the country, which we shall now endeavour to explain.

Late sowing, or the incomplete maturity of the plants, are circumstances which are favourable to the propagation of smut; for the seeds sown in that case produce plants weak and languishing, and which cannot resist the contagion.

The shade of houses, or of great trees, a soil either ill cultivated, or where the cultivation is fresh and recent, are likewise causes which produce and multiply smut. Rainy and cold seasons, fogs and vapours, are much to be dreaded. Fields near to ponds and rivers are ordinarily more infected with this parasitical plant, than those which are more distant, and consequently less subject to such influence. Experience has likewise proved, that wheat sown in the morning, in a thick fog, is more subject to the smut than when sown in the middle of the day, when the fog is dissipated.

To these remarks I shall add a curious fact, contained in "*Le Cours complet d'Agriculture*." The author says,

A farmer, on working the lands of a rich commandery at Malta, was found by M. Hardouin sitting on a sack of seed. It was on a beautiful day, the sun shining brilliantly, and not a cloud to be seen. M. Hardouin went up to him, and asked him why he was not sowing? "Because the land is ill," said the labourer. "What is the matter with it?" replied M. Hardouin. "It sweats, (said the other): Stoop down, and you will see a cold vapour coming from it. I am sixty years old, and this was pointed out to me by my father. I shall wait, or else I should have black wheat." He considered this transpiration as having an influence upon the seed, if sown during its occurrence. This labourer added, that in the preceding

year there had only been two days proper for sowing, and that the harvest was most abundant, while the part of the field which was sown in unfavourable weather, produced a prodigious quantity of smutted corn.

The older smut is, the longer time it requires to commence its vegetation, and when it is very old, it does not vegetate at all. Wheat infected with smut six years old, is not so apt to be diseased as that which is quite new; and at the end of some years it ceases to vegetate. M. Tillet propagated this malady for twenty years with the powder of the smut of the same year, and at last it produced no effect.

Cold and strong frosts do not injure, to any degree, the developement of the seeds of smut. When put in water of forty degrees, it vegetated with difficulty; when put in boiling water, and in every other respect similarly treated, it lost very quickly its power of germination.*

Let us next consider the preventives which have been made use of against this scourge of agriculture.

It has been remarked for a long period, that there are several substances united to water, which give it the faculty of destroying the germ of smut.

M. Tessier, after trying a great number of experiments, proposed four methods, of which lime formed the basis. In the first, it is simply mixed with water; in the second, it is combined with some salts; in the third, it is mixed with volatile alkali; and in the fourth, with fixed alkali, potash, or soda. In the three first-mentioned methods he puts two gallons of the liquid, very hot, upon about three bushels of corn; and in the fourth method, about five pints more of the liquid to the same quantity of corn. The

* It has been ascertained in Scotland, that *kiln-drying seed wheat* is an effectual preventive against the smut; but it requires to be done with great precaution, that it may not injure the germ of the wheat.

best mode of using these steepings, is to leave the corn in them from twenty four to twenty eight hours. In the third method, a quantity of pigeons' or fowls' dung, which gives out ammonia, should be steeped in the liquid for a fortnight previously to its use.

Besides these steepings, the Abbé Tessier recommends, that before the seed be submitted to the operation, it be purified, either by washing in warm water, by sifting through the hands, or by means of mills, sieves, &c.

The following is the method of M. Cadet de Vaux, which he calls *steeping by immersion*, because the seed is plunged into the liquid, instead of pouring the latter upon it. You first put the wheat in a tub containing the liquid. Boil a portion of the water, in which lime has been slaked. The proportions are about 240lb. of corn to from four to five gallons of water, according to the greater or less dryness of the seed, with from 2lb. to 2½lb. of quicklime, according to the strength of the latter, or to the greater or less quantity of the smut: then add the remainder of the water. The heat of the whole ought to be such, that the hand can scarcely be held in it. You then pour gradually the lime-water upon the seed, stirring both about, the latter with a spatula, the former with a fork or peel. It is necessary for the water to be about three or four fingers' breadth above the corn, as it will soon absorb this quantity: then cover the vessel, and leave the seed immersed for twenty-four hours, taking care to stir the whole about five or six times in the course of the day; or else open the spigot, draw off the liquid, and pour it on again.

The dung should be diluted in the portion of cold water, with any thing else that may be intended for use as manure; or dunghill water may be used instead of the cold water.

At the expiration of twenty-four hours, withdraw the steeping, and take out the corn; it is then fit to be sown

on the same day ; for by exposing it to the air only a few hours, it gets dry enough to slip through the hands.

It appears that in all these steepings the lime acts upon the smut, either mechanically, by forming a sort of crust or varnish upon the seed, which afterwards comes off, and carries with it a part of the smut ; or, which is more likely, by a chemical effect, which destroys the particles, or gemmes, by depriving them of the faculty of germinating.

Such are the methods which some writers have proposed and others recommended, and which are at the present time almost generally adopted. Yet it is my opinion, that these preparatives, which were doubtlessly the most safe and advantageous known at the time they were described, ought to give way to the more effectual discoveries of the present day.

In fact, experience has proved, that steeping the seed does not always answer the object of those by whom it is practised, even after they have taken the greatest care. The chemical action, when lime-water is applied, is weak, and cannot always preserve wheat from the attacks of smut, which so closely attaches itself to the grain. On the other hand, whatever is the mode of washing wheat, though it may remove a considerable quantity of the smut, it may not always destroy the whole.

If the effect of steeping is uncertain, and if the operations which it requires are tedious, and in some degree expensive, that is not the case when the sulphate of copper, (or copperas, or blue vitriol), as proposed by M. Benedict Prevost, is made use of, which is much simpler, and, I believe, *infallible*. I shall give his method in a few words : we cannot propagate too much his important discoveries.

In searching for those substances which unite in the highest degree all the qualities of a preventive applicable to agriculture, the author discovered, by a fortunate accident, that copper was the one to be preferred. Having

put several hundred of the seeds of smut into water which had been distilled in an alembic of copper, to his great astonishment, he observed that these seeds either did not vegetate at all, or very imperfectly, whilst other seeds, put in ordinary water, germinated as usual. Thence he directed his researches to copper and copperas salts, and he obtained from thence the happiest and most satisfactory results.

In order to ascertain the extent of the influence of the copper upon the germination and vegetation of smut, he made use of a plate of this metal, entirely freed from verdigris, containing a surface of two square inches. He found, that after the plate had remained sixty or sixty-two hours in the water, the seeds which he afterwards placed upon it, either did not come up at all, or came up very ill, and produced only deformed stems on the surface of the water; at the bottom he perceived no symptom of vegetation. But as such a process would be very inconvenient in practice, he directed his attention to the effect of salts from copper, and particularly to the sulfate of copper, or blue vitriol, as being the most easily procured. The result of these experiments is ;

That smut does not germinate at all in common water, in which there has been dissolved a 280,000th part of its weight of sulfate of copper, the temperature being five or six degrees. That the presence of this salt, in the proportion of a 600,000th, or even a 1,000,000th part, retards it perceptibly. And lastly, that a solution of this sulfate in water, in the proportion of a 10,000th part of its weight, is sufficient to take from smut the power of germinating, when steeped in it only for an hour or two, though washed immediately afterwards.

But it was not enough to observe the effects of copper and the sulfate of that metal upon the germination of smut, placed in water, or upon moist substances; it was also

necessary to try experiments upon infected grain, sown in the open field: this is what M. Prevost undertook with equal success.

Infected grain, steeped in water which had remained two days in a copper vessel, where it was occasionally stirred about, and the copper a little rubbed, gave one-sixth of smut.

Infected corn, steeped in boiling water in the same vessel, when the water grew cold, gave one-sixth of smut.*

Infected corn, well steeped in a solution of sulfate of copper containing this salt, in proportion of four *decagrammes* to each *hectolitre* of corn, gave a 100th of smut.†

Infected corn, well steeped in a solution of sulfate of copper containing this salt, in the proportion of twelve *decagrammes* to each *hectolitre*, gave a 300th of smut.

Infected corn, simply scalded, gave one-fifth of smut.

Infected corn, sown without any preservative, gave a third of smut.

Sound corn, sown without any preservative, gave one 150th of smut.

Verdigrise acts upon smut nearly like sulfate. Sulfate of iron, or green vitriol, and the white oxyd of arsenic, which is used in England, only produce constantly such effects when used in much greater proportions.

Hence it appears, that sulfate of copper ought, as I have already said, always to have the preference. The following is the mode of using it on a great scale.

Put into a tub as many times fourteen *litres* of water as you have *hectolitres* of corn to prepare, and dissolve as many times nine *decagrammes* of sulfate of iron (blue

* It ought here to be remarked, that these two experiments may be said to have been confounded on the soil; and that it is to be presumed, that the first ought to produce much less smut than the second.

† In Appendix No. IV French weights and measures are converted into English.

vitriol of commerce). Have two other tubs, each capable of containing two or three hectolitres. Put into one of them twelve or fifteen decalitres of corn, and pour upon it the solution, till it rises five or six inches above the corn. Stir it well about, and carefully take off all that floats. Put corn in the other tub; and treat it in the same manner. Place cross-pieces over the latter tub, and put on them a basket, or sieve, of such a texture that it will allow the water to pass through freely, without letting the corn escape along with it. When the wheat has remained about half an hour under water, take it up with a copper hand-shovel, together with a certain quantity of the liquid, and pour the latter off roughly, in order to disengage from the steeped corn any of the light grains; then empty the corn into the basket, or sieve, till it be full; and when the corn has sufficiently drained, it may be put in a heap. When all has been taken out of the first-mentioned tub, more may be put in, stirred about, skimmed, &c.; and then, placing the basket on the latter tub, you perform the same operation over the latter from the former, as you did over the former from the latter, &c.

The corn thus prepared is soon dry enough for sowing. If, however, it should be necessary to keep it unsown for some time, it will be advisable to stir it about frequently.

However much the corn may be smutted, this process will destroy the germ of the smut; but if the corn should contain a great number of grains entirely corroded by the smut, as such are not easily saturated by the solution, and as it may be apprehended that they will not burst till after they are taken out of the liquid, when they infect the rest of the grain, it is necessary to separate them by some means or other, or else to double the dose of sulfate and the time of immersion, performing the rest of the operation as above described.

It may be supposed, that it is necessary to take great care that the prepared corn be not infected again, either by the dust arising from any portion that may be stirred near it; by putting it into sacks that may contain some smutted grains; or by throwing on the field that has been sown any straw not sufficiently consumed for manure, which may retain some of such grains. It should also be observed, that if the wheat is very damp when it is put into the solution, the effect intended may not take place, or at least it may not be complete. Therefore the corn ought not to be put in, except it be very dry. Poultry may eat corn thus prepared, without any danger.

I have just pointed out the most efficacious means for preventing the terrible effects of this disease. It were to be wished, that agriculturists would feel their importance. If they were all to make use of them, the smut would shortly be obliterated from the whole kingdom. But how is it possible to induce them to alter their old customs, and to do away all their prejudices and their errors? Few of them adopt good processes; most of them do not use lime water; and others have private recipes, that have been transmitted from father to son, the imperfections of which are not always the only evils to be feared from them. When it is considered that a mere particle of the dust attaching itself to a single grain of wheat is sufficient to produce a whole smutted ear, which may afterwards affect an entire field, and destroy a whole harvest, the consequence is alarming. One cannot view without shuddering, the censurable indifference of those prejudiced practitioners, who, while the national subsistence depends upon their exertions, are gradually destroying it, and contributing to produce the most dreadful scarcity and misfortune to a whole nation, by converting into poison the food intended to support it.

II. Of the Rust.

The *rust* is a yellow powder, of the colour of iron-rust, which is seen on the stalks and leaves of a great number of vegetables, and particularly from the month of April on those of wheat. This dust forms upon them lineal and parallel spots ; it is also combined in little tubercles, formed by the dilated epidermis, and when they burst, it spreads outside. It readily sticks to the fingers, and has no perceptible taste or smell. When seen through the microscope, it appears to be composed of spherical or oval globules, larger in general than those of smut.

For a long time naturalists did not agree in opinion as to the cause of the rust. Messrs. Tessier and Tillet attributed it to the influence of fogs. The former thought it was caused by the total suppression of transpiration from the corn, in consequence of its being enveloped by this humid atmosphere ; the latter supposed that it was occasioned by the acrid particles of the fog, acting upon the leaves and stalks, and thus, by rupturing their delicate texture, causing the extravasation of a juice, which, on becoming dry, was converted into a sort of dust. Other observers thought that the rust was produced by the superabundance of the nourishing juice, resulting from a vigorous vegetation. M. Rozier imagined that dung manure contributed to the rust, but that dew was the principal cause of it. All these hypotheses, however, are erroneous ; and it is now clearly proved that this disease of corn, is produced by real intestinal plants, is similar to those of the smut, and of the genera *Uredo* and *Puccinia*.

The seeds of these parasitical vegetables shoot out like those of the smut, in water, where they may easily be perceived. If adhering to grains of corn, at the time of their

germination, or even to the young and tender plants, they produce filaments which insinuate themselves through the epidermis, where they fructify, and force it, by their accumulation, to burst in order to open a passage for them. Sometimes both the genera abovementioned are united in the same tubercle; at others it is filled only with one or the other: it is often in the black tubercles, which answer to those on the opposite surface of the leaf, that we find the *Pucciniæ*. The *Uredo* forms the yellow dust.

I have observed that the rust is found in a great number of plants; I shall add that, like them, it appears to vary. The rust which attacks one plant, is seldom of the same species as that which attacks another. The *dogs-grass*, and the *rye-grass*, are the plants on which, next to wheat, the rust is most frequently found; but as the history of *Uredos* is the same as that of the *Uredo* of wheat, it is unnecessary to detail it.

The rust of the leaves of corn, (which is the *linear Uredo* and *Puccinia* of grasses, of Decandole,) generally appears little by little. The lower leaves of the same plant, are often loaded with it, while it has not made its appearance on the upper leaves. Sometimes also, many feet in extent of corn have it, while in the same field, and close by them, as many other feet are not at all infected by it.

As the nature of the rust is now well known, it will be clearly seen that fogs cannot be the cause of this disease; they may facilitate its propagation; but still even this is not certain; and experiments, on the contrary, seem to prove that this propagation is in an inverse ratio to their duration. Nevertheless, as the presence or absence of the rust doubtless depends on many other causes, this fact requires farther observations before it can be confirmed.

I shall not say more on a disease, the effects of which, are not so fatal as those produced by the smut, and the *charbon*, or mildew. The means employed for preserving corn from these fatal diseases secure them also against the rust, by destroying its germs.

Of the Charbon, or Mildew.

Notwithstanding some authors have made a distinction between the *nielle*, or mildew, and the *charbon*, they ought to be considered as one and the same disease; and which, next to the smut, is the most terrible malady known in wheat, barley, and oats. The panicles of this last mentioned plant, when it is attacked by it, on coming out, are as black as if they had been burnt, and all the parts of the seed, of which there often remains nothing but unformed rottenness, are covered with a blackish dust, not very adhesive, inodorant when fresh, but exhaling a disagreeable and putrid smell on being wetted.

This is not the place to state the different hypotheses that have been formed relative to the disease in question, and all the errors to which they have given rise. I shall merely touch upon the first opinion of M. Bulliard, which has been the most generally adopted. He thought, and with reason, that the *charbon* was not a disease, but rather a series of degenerations of different organized and growing plants. He saw in them nothing but a heap of small seeds of a mushroom, of the *reticularia* genus—a genus, most of whose species attach themselves to living vegetables, and cause them to die in a short time. These grains, which are extremely minute, are, in his opinions carried by the wind upon the blossoms, and even conveyed within the pericarpium, before it bursts: they insinuate

themselves even into the seeds, where they take root, and are nourished by their nutritive juices, and propagate vast quantities of other grains of a similar nature.

Some more fortunate observations have given us more certain ideas as to this destructive evil; but it must be owned, that if M. Bulliard is not precisely right, his opinion comes very near to the fact. But it is now known that the *charbon* is produced, like the other diseases already mentioned, by intestinal plants in the corn; that is, *by the black-dust Uredos, which present phenomena similar to those of the smut, and of the Uredos with yellow, orange-coloured, or brown dust.* Their dust is, in fact, nothing more than *gemmes*, or particles, most of them much more diminutive than those of the smut or rust. They also grow in water, and produce naked and simple stalks, which are sometimes, but very seldom, double or treble. Those that float on the surface of the water often put forth *aigrettes*, or a collective series of globules; but the whole of these are much smaller than those in the smut, or the rust, and are consequently much more difficult to be seen.

We discover the *charbon* of wheat in the stalks, when the plants are much younger, and farther from ripening than when we find the smut in them. In general, feeble plants are more attacked by it than those that are vigorous.

The preservatives made use of against the *charbon* are the same as those that I have sufficiently described for destroying the smut. Agriculturists cannot be too earnestly entreated to pay the greatest attention to their choice of seed corn, and particularly to prepare it well before sowing, either with lime or the sulfate of copper. Their own interest, so deeply united as it is with that of the people, ought to induce them to employ the latter preservative, *which would be highly to their advantage.*

Of the Spur, or Ergot.

The *Spur* is a disease that has long been known, and is peculiar to rye, and some other graminous plants. It is also called by the French, the *Clou*, *horned rye*, &c. It is a production of the seeds, is long, horny, and cartilaginous; and is sometimes straight, at others curved; sometimes it is found more than two inches in length. The resemblance of this substance to cocks' spurs has given it the name by which it is distinguished. On breaking a spurred seed, you find within it a substance of a dull white colour, adhering to the violet skin that surrounds it. Rye, thus attacked, cannot germinate.

The causes of this disease are not rightly understood. On surveying the different opinions of philosophers, we find nothing but doubt and uncertainty. These opinions, however, may be reduced to seven.

The first attributes the spur to the humidity of the air; the second, to the seed getting mouldy in the ground, when it does not readily germinate; the third, to the presence of a caterpillar or other insect, which perforates the seed, and thus creates in it a sort of sore; the fourth ascribes it to the moisture of the soil; the fifth, to a defect in its fecundity; the sixth, to parasitical plants of the mushroom family; and the seventh, is the opinion of Gaspard Bauhin and M. Taranget of Douay, who attribute the spur to the rupture of the seed, occasioned by too great an abundance of the juices of the plant, which burst out, and run over. To give more precision to these ideas, I shall reduce the above opinions to five. The first and fourth can only make one, since the atmosphere is never so humid as in countries, where the soil is habitually damp: the fifth also is only an immediate consequence of all the

others, or of one of them alone ; the third is scarcely probable, while the rest have a character of reality.

The opinion which attributes the spur to the mouldiness of the seed in the ground, is supported by an instance that occurred in 1784, when the rye that was sown in a light soil got mouldy before it germinated. Hence, in that year, the crop abounded in spurred plants. The observations of Messrs. Gaspard Bauhin, and M. Dodart, appear to confirm this last opinion. They both assert that the spur is very general, when heavy rains are succeeded by hot weather.

M. Tessier remarked that the most rainy years were the most productive of this disease ; that the soils on which most spurred rye grew, were most moist ; that high grounds were nearly free from them, unless when the furrows prevented the water from running freely off, while the lower parts of the same field produced more than the upper parts, &c.

This disease is not contagious, nor is it propagated year after year. Nevertheless the effects it produces on persons who eat bread made from the rye that is infected by it, are sometimes terrible. It is said to be a real poison, which almost always occasions death, after causing convulsions, heaviness, giddiness, and most acute pains in the limbs. It generally affects the legs, feet, arms, and hands, with a disease called the *dry gangrene*, insomuch that they dry up and fall off. Men have been seen attacked with this disease, who, though with only the head and body remaining, have nevertheless lived several days in this deplorable state ! M. de Salene, a physician of Orleans, asserts in an essay published in 1748, that out of an hundred patients four only escaped.

Spurred rye is equally dangerous to animals. Sometimes they have been cured by means of milk. The same

remedy is therefore worthy of trial upon man. M. Taranget, already mentioned, thinks that in all cases, the generated limb ought never to be amputated; but that it should be left to nature to separate the dead from the living part. All that can be done is to prepare the parts for this separation.

I shall add nothing to this sketch of the calamities which spurred rye sometimes produces. It is terrific to reflect on the inattention with which this plant is cultivated; it being often sown with the utmost disregard, in lands favourable for the cultivation of corn. In general, the farmers are not choice in their seed: they seldom steep it; and in short take scarcely any precautions. It is therefore useful to offer advice to them, and to repeat, that to avoid such serious accidents, they ought to sow rye in none but high lands; and that in moist ground the furrows ought to be carried higher than usual, in order to give the water every facility for running off. Mr. Tessier thinks that it would be advisable to sow rye only on soils that have been ploughed several times, and sufficiently prepared. He suggests also, that the spurred seed should be separated from the rest, by means of cribbles, the holes in which should only allow the good grains to pass, as these are smaller than the spurred ones.

Of the Running.

By the expression *running* (*couleur*), when applied to fruits, we understand *not setting*; or *miscarriage*, when speaking of flowers. Corn, and in general all the cereal plants, are exposed to this unfruitfulness. The ears, instead of being filled with good seeds from top to bottom, have them only at the lower part, or else the seeds are less numerous, and deficient in flour.

The variations of the atmosphere, such as abundant rains and high winds, when the flowers get entangled, cause the fecundating dust to be carried off, and occasion miscarriage. Frosts, thick and frequent fogs, too great dryness, and even lightning, may be considered as so many causes which produce this unfortunate accident amongst corn.

Of the Laying, or laying down of Crops.

The *laying* of wheat (called in French *La verse*, or *Le versage*), and many other cereal plants, is an accident occasioned by high winds, storms, heavy rains, or by too much fulness acquired by the plants through hot and moist weather. It then happens that the stalks are large, but hollow and soft; their herbaceous and fibrous parts being only nourished by water, they are weak and smooth; hanging down and twisting together by the most trifling cause.

If the laying takes place in the month of July, a period when the grain approaches to maturity, its effects are little to be feared, because they do not generally prevent it from obtaining its nutriment, and ripening; but if it occurs before the ripening, it may materially injure the crop. The stalk by being laid, cannot convey nourishment to the grain; its canals are obliterated, and the passage of the sap is necessarily interrupted.

It is scarcely possible to prevent the laying of corn, which happens, as I have said, from heavy winds and rains, &c. Nevertheless it has been observed, that corn, when clear-sown, is less liable to be laid, because it grows stronger and expands more; while, on the contrary, when it is thickly sown, the sap always rises perpendicularly, the stalk grows too high, and has not sufficient power of resistance; it therefore bends and falls, either from the least agitation, or from the weight of the rain that presses it down.

Result of the Inquiries regarding the Mildew in Wheat.

By Sir John Sinclair.

1. That the mildew is occasioned by intestine parasitical plants, either adhering to the seed when sown, or taken up from the soil by the roots of growing wheat, or other grains; and that all we see externally is their fructification. These plants are a species of mushroom, of the *Reticularia* tribe, which attach themselves to, and occasion the destruction of living vegetables. In some respects they are analogous to worms in the human body.

2. That the seeds of this parasitical plant, there is every reason to believe, either adhere to the seed, or arise from the root; in confirmation of which it may be stated, that every attempt made, with great care, by T. A. Knight, Esq. to communicate the mildew from infected straws to others, has uniformly proved abortive.

3. That every circumstance that tends to weaken the stem or straw of plants of wheat, as lightning, violent heat, the crop being laid flat, &c., or to render the stem more porous, and less firm or compact, as over manuring, extra cultivation, great moisture in the soil, or in the atmosphere, or early frosts, is favourable to the propagation of mildew, enabling the intestine parasitical plant to come out, and to fructify.

4. That applications to the seed have been found an effectual remedy against another species of intestine parasitical plant, which occasions the smut;* but as the seeds of the plant which occasions the mildew, are much smaller

* From analogy, therefore, adequate preparations applied to the seed, may destroy the powers of other parasitical plants. It would appear indeed, that unless the germ of the plant has been infected, the disease will not take effect.

than those whence the smut originates, it requires more minute attention to prevent that disease.

5. That applications of the sulphate of copper, (copperas or blue vitriol) or of verdigrise, to the seed of wheat, will destroy the seeds or gemmes of these parasitical plants, which occasion the mildew, if they adhere to the seed ; and it also appears, both from recent discoveries and the continued experience of the farmers in the Pays de Waes, (*who have for ages prepared their seed with verdigrise, and whose crops are never infected with mildew*), that the roots of wheat may be so fortified against infection, by such applications, that the mildew never attacks the plants whose seeds have been properly prepared ; more especially if a change of seed has been at the same time attended to.